

Arithmetic
for
Everyday Use
Book 2

by

G. F. Pew

and

W. H. Jennings

CURRICULUM

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bk.2

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CURR HIST

TO THE STUDENT

1. STUDY THE INSTRUCTIONAL MATERIAL GIVEN WITH EACH UNIT.

Basically, arithmetic is a matter of addition, subtraction, multiplication and division. Commercial arithmetic involves the application of these fundamental operations to business transactions. It is obvious, therefore, that you must become familiar with business practices in order to apply the principles of arithmetic to business transactions.

Each unit in this workbook illustrates and provides practice in applying basic operations to business problems. A minimum of instructional material, which is intended to provide a basis for class-room discussion on the topic, is followed immediately by a wealth of exercise material. As far as has been considered feasible, the material is drawn from assignments likely to be encountered by the student.

2. PRODUCE THE KIND OF WORK REQUIRED BY AN EMPLOYER.

To meet this objective:

- (1) *Accurate.* Check accuracy in all your work.
- (2) *Neat and legible.* Set up your solutions so that they stand out distinctly.
- (3) *Grammatically correct.* Be particularly careful of the equal signs.

3. COMPLETE YOUR ROUTINE WORK.

4. COMPLETE THE REVIEW.

5. KEEP YOUR FINISHED WORK.

Your solutions to the problems should be immediately after the statement of the problem. You will find this arrangement very helpful in preparation for tests and examinations. Of course, the effectiveness of your review will depend upon the accuracy of your original work.

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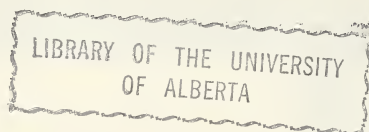
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ADDITION AND SUBTRACTION

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ADDITION AND SUBTRACTION OF WHOLE NUMBERS

1. Find the net weight of the following loads of coal. Add the columns and prove your work.

DELIVERY DATE	GROSS WEIGHT	WEIGHT OF TRUCK	NET WEIGHT OF COAL
Sept. 8	8,537 lb.	4,497 lb.	
" 9	9,587 lb.	5,485 lb.	
" 10	10,974 lb.	6,138 lb.	
" 11	12,726 lb.	7,225 lb.	
" 12	11,683 lb.	5,395 lb.	
Totals			

2. Find the number of cubic feet of gas used by each consumer for one month. Prove by totals.

CONSUMER	LAST MONTH'S READING	THIS MONTH'S READING	CUBIC FEET OF GAS USED
A	15,593	16,798	
B	12,198	14,635	
C	22,683	26,576	
D	2,975	3,847	
E	5,263	9,789	
Totals			

3. Find the daily excess of cash receipts over cash payments in the following table. Prove your work by totals.

DATE	CASH RECEIPTS	CASH PAYMENTS	DAILY BALANCE
Sept. 2	\$2,698.55	\$1,326.75	\$
" 3	2,089.48	1,638.42	
" 4	3,542.78	1,519.63	
" 5	4,106.23	2,865.98	
" 6	2,789.42	1,967.87	
Totals	\$	\$	\$

MULTIPLICATION AND DIVISION OF WHOLE NUMBERS

Multiplication by numbers up to twelve should be completed in one operation. You should review the multiplication tables thoroughly.

1. Multiply as indicated below.

4 6 5 3 2 7	2 3 6 8 7 7	4 5 6 7 8 9	7 8 0 9 6 4	3 8 9 6 2 3
2	3	4	5	6
2 4 6 6 3 8	3 4 3 4 6 2	9 8 6 7 2 3	5 3 7 8 3 9	4 6 9 8 7 2
7	8	9	1 1	1 2

Frequently, in calculating or checking invoices, the office worker must multiply horizontally. This should be done directly with numbers up to 12.

2. Extend and total the following invoices.

(1)

(2)

24 lb. @ .07 per lb.		125 yd. @ .11 per yd.		
35 " " .09 " "		319 " " .12 " "		
67 " " .11 " "		108 " " .09 " "		
89 " " .06 " "		125 " " .06 " "		
52 " " .07 " "		305 " " .08 " "		
Total		Total		

(3)

(4)

127 lb. @ .06 per lb.		6 lb. @ 1.29 per lb.		
319 " " .11 " "		7 " " 3.15 " "		
408 " " .09 " "		12 " " 4.11 " "		
511 " " .07 " "		11 " " 2.07 " "		
293 " " .03 " "		9 " " 11.25 " "		
Total		Total		

(5)

(6)

3 tons @ 18.25 per ton		12 baskets @ 1.25 per basket		
5 " " 21.50 " "		9 " " .85 " "		
12 " " 23.50 " "		11 " " 1.15 " "		
9 " " 24.25 " "		7 " " 2.20 " "		
6 " " 26.10 " "		8 " " 3.25 " "		
Total		Total		

MULTIPLICATION AND DIVISION OF WHOLE NUMBERS

In multiplying by numbers larger than 12, you must carefully align all the figures in your solution.

1. Keeping the figures carefully aligned, multiply as indicated below. Remember to check carefully.

(a) $\begin{array}{r} 656389 \\ 3456 \end{array}$	(b) $\begin{array}{r} 976834 \\ 5268 \end{array}$	(c) $\begin{array}{r} 356729 \\ 2736 \end{array}$	(b) $\begin{array}{r} 642071 \\ 5987 \end{array}$

Short Methods in Multiplication

You have learned that certain numbers lend themselves to convenient short-cuts in multiplication. Here is a brief review of three common short-cuts.

- (1) With numbers ending in zero or zeros, multiply by the number preceding the zero and add a zero for each zero in the multiplier.

EXAMPLE — $300 \times 17 = 3 \times 17$ plus 2 zeros = 5100

- (2) With numbers that are simple fractions of 100, multiply by adding 2 zeros, and divide the result by the number of times the number is evenly contained in 100. This can also be done with fractions of 1000, 10000, etc.

EXAMPLE — $25 \times 64 = 6400 \div 4 = 1600$ (25 is one quarter of 100)

EXAMPLE — $125 \times 64 = 64000 \div 8 = 8000$ (125 is one eighth of 1000)

- (3) With numbers that are close to 100, multiply by 100 (add 2 zeros), and add or subtract to adjust your answer.

EXAMPLE: $101 \times 24 = 100 \times 24 = 2400$
 Add $1 \times 24 = 24$
 = 2424

EXAMPLE — $99 \times 24 = 100 \times 24 = 2400$
 Subtract $1 \times 24 = 24$
 = 2376

2. Multiply, using short methods:

$101 \times 27 =$					$101 \times 26 =$					$101 \times 37 =$				
$100 \times 12 =$					$700 \times 8 =$					$900 \times 11 =$				
$50 \times 36 =$					$48 \times 75 =$					$224 \times 25 =$				
$102 \times 22 =$					$105 \times 21 =$					$99 \times 65 =$				
$58 \times 50 =$					$16 \times 25 =$					$32 \times 75 =$				
$102 \times 41 =$					$1001 \times 27 =$					$101 \times 162 =$				
$44 \times 25 =$					$99 \times 31 =$					$102 \times 61 =$				
$101 \times 78 =$					$64 \times 25 =$					$200 \times 124 =$				

MULTIPLICATION AND DIVISION OF WHOLE NUMBERS

Division by numbers up to 12 should always be done by short division. A thorough knowledge of the multiplication tables up to 12 is essential for rapid and accurate division.

1. Complete the following exercises by short division.

(a)	(b)	(c)	(d)
$\begin{array}{r} 5 \overline{) 96470220} \\ 6 \overline{) } \\ 7 \overline{) } \end{array}$	$\begin{array}{r} 2 \overline{) 25407360} \\ 3 \overline{) } \\ 4 \overline{) } \end{array}$	$\begin{array}{r} 8 \overline{) 355523040} \\ 9 \overline{) } \\ 10 \overline{) } \end{array}$	$\begin{array}{r} 8 \overline{) 88665984} \\ 9 \overline{) } \\ 11 \overline{) } \end{array}$
(e)	(f)	(g)	(h)
$\begin{array}{r} 9 \overline{) 756213480} \\ 10 \overline{) } \\ 11 \overline{) } \end{array}$	$\begin{array}{r} 7 \overline{) 426501936} \\ 8 \overline{) } \\ 9 \overline{) } \end{array}$	$\begin{array}{r} 9 \overline{) 144473868} \\ 11 \overline{) } \\ 12 \overline{) } \end{array}$	$\begin{array}{r} 9 \overline{) 263999736} \\ 11 \overline{) } \\ 12 \overline{) } \end{array}$

For divisors greater than 12, long division should be used. It is essential that the numbers be aligned correctly in the solution if errors are to be avoided.

2. Divide the following numbers by long division.

(a)	(b)	(c)
$24 \overline{) 16128}$	$57 \overline{) 35423}$	$327 \overline{) 41856}$
(d)	(e)	(f)
$1673 \overline{) 9763842}$	$9287 \overline{) 6930063}$	$3694 \overline{) 20621345}$

PROBLEMS INVOLVING WHOLE NUMBERS

Show neat solutions for the following problems.

1. A man bought a house for \$7,500 and sold it for \$10,000 the following year. During the year, he installed a new furnace costing \$800, insulated the house at a cost of \$250, and redecorated to the extent of \$450. Did he make any profit on the transaction, and, if so, how much?

2. How long will it take to type three pages of material, 27 lines to a page, 80 strokes to a line, at an average of 24 words a minute? (Assume that there are five strokes in each word.)

3. A car can be purchased for \$1,800 by paying \$240 down and the balance in equal monthly payments over a period of 12 months. Can a man who earns \$240 a month, and who needs \$150 a month for living expenses for his family, afford to buy the car, assuming that he has enough saved for the down payment?

4. A cash register contained \$25 in change at the beginning of the day. During the day, sales amounting to \$887.24 were rung up, and payments amounting to \$234.50 were made out of the register. At the end of the day, the cash was counted, and amounted to \$679.84. Was the cash over or under, and, if so, by how much?

PROBLEMS INVOLVING WHOLE NUMBERS

5. A storekeeper bought 5 crates of strawberries at \$4.80 a crate, and 3 crates at \$6.00 a crate. He sold the first lot at 40 cents a box, and the second lot at 50 cents a box. What was his profit? (There are 24 boxes in a crate.)

6. Out of a tank containing 750 gallons of gasoline, a service station attendant made the following sales: to 15 cars, 12 gallons each; to 25 cars, 10 gallons each; to 22 cars, 5 gallons each; and to 10 cars, 2 gallons each. What was the average sale per car?

7. Students sold 120 tickets for a school dance at 75 cents each. At the dance, 8 cases of soft drinks (24 bottles in each case) were sold at 10 cents a bottle. The expenses of the dance were: orchestra, \$40; decorations, \$10; and soft drinks, \$1.68 a case. What was the net revenue from the dance?

8. A man earning \$200 a month is considering buying a television set for \$400, to be paid for in equal monthly instalments over a 10-month period. If his living expenses (food and other household items) are \$140 a month, how much would he have left for other expenses each month while buying the set?

GENERAL PRACTICE IN FUNDAMENTAL OPERATIONS

Copy the following columns of figures in the spaces provided below, and add. Figures should be neat and legible. Check your addition carefully; one error makes the work valueless.

1.	2.	3.	4.	5.
11,275.25	12,436.75	15,368.29	14,386.58	15,253.86
16,375.29	24,856.94	46,936.85	64,867.34	45,731.09
22,564.98	11,967.46	24,754.83	12,745.39	46,835.29
13,738.47	34,964.20	41,831.27	54,837.92	56,846.38
5,847.84	4,837.25	4,731.94	5,749.36	2,846.39
567.92	846.93	569.23	125.95	583.38
14,921.75	56,835.13	93,836.25	52,563.68	24,746.39
6,385.97	5,821.53	8,392.57	8,264.35	7,735.85
7,839.13	5,735.96	6,836.93	7,946.37	5,747.82
91,493.75	68,364.78	73,284.18	51,352.96	21,946.83
6,846.04	7,385.96	2,946.73	9,836.45	2,573.97
758.94	496.48	364.86	583.96	481.36
26,598.35	74,736.82	15,695.37	29,146.73	31,846.29
11,857.39	53,748.93	42,831.95	41,573.28	23,743.91
5,128.76	7,382.18	4,937.16	7,123.45	9,758.63
14,957.38	15,836.25	15,846.93	42,146.83	15,148.41
31,157.17	41,146.38	39,131.11	42,456.38	16,954.38
645.73	739.13	946.27	127.46	364.57

[illegible]

UNIT 2

FUNDAMENTAL OPERATIONS WITH FRACTIONS

H. C. F. AND L. C. M.

Operations with fractions require the use of the Highest Common Factor (H.C.F.) and of the Lowest Common Multiple (L.C.M.). The following examples review the methods of finding the H.C.F. and the L.C.M.

The H.C.F. is the greatest factor common to two or more products.

EXAMPLE 1—Find the H.C.F. of 24 and 36.

The prime factors of 24 are $2 \times 2 \times 2 \times 3$.

The prime factors of 36 are $2 \times 2 \times 3 \times 3$.

The common factors of both numbers are $2 \times 2 \times 3$.

The H.C.F. is therefore $2 \times 2 \times 3 = 12$.

EXAMPLE 2—Find the H.C.F. of 792 and 968.

$$\begin{array}{r}
 1 \\
 792 \overline{) 968} \\
 \underline{792} \quad 4 \\
 176 \overline{) 792} \\
 \underline{704} \quad 2 \\
 88 \overline{) 176} \\
 \underline{176}
 \end{array}$$

The H.C.F. is the last divisor, 88.

The L.C.M. of two or more numbers is the smallest number that is a multiple of each of them.

EXAMPLE 3—Find the L.C.M. of 18, 24, and 36.

$$\begin{array}{r}
 2) 18, 24, 36 \\
 3) 9, 12, 18 \\
 3) 3, 4, 6 \\
 2) 1, 4, 2 \\
 1, 2, 1
 \end{array}$$

Note 1: Only prime factors are used as divisors.

2: If the divisor leaves a remainder, merely bring down that number.

$$\text{The L.C.M.} = 2 \times 3 \times 3 \times 2 \times 2 = 72.$$

1. Find the H.C.F. of each of the following pairs of numbers, using the method illustrated in Example 1.

(1) 28 and 40	(2) 56 and 84
(3) 42 and 72	(4) 48 and 120

H. C. F. AND L. C. M.

1. Find the H.C.F. of each of the following pairs of numbers, using the method illustrated in Example 2 on the preceding page.

(1) 192 and 256	(2) 176 and 256
(3) 780 and 1530	(4) 308 and 693

2. Find the L.C.M. of the following groups of numbers:

(1) 8, 18, 12, 30, 20	(2) 14, 21, 12, 28, 56
(3) 5, 15, 8, 20, 12	(4) 24, 36, 45, 60, 18

REDUCTION TO LOWEST TERMS, EQUIVALENTS, AND ADDITION OF FRACTIONS

Reduction of Fractions to Their Lowest Terms

EXAMPLE—Reduce $\frac{105}{462}$ to its lowest terms.

Divide the numerator and denominator by common factors until further reduction is impossible.

By using the factor 3, $\frac{105}{462}$ becomes $\frac{35}{154}$; then, by using the factor 7, $\frac{35}{154}$ becomes $\frac{5}{22}$.

1. Reduce the following fractions to their lowest terms.

(1) $\frac{98}{126}$	(2) $\frac{64}{368}$	(3) $\frac{81}{135}$	(4) $\frac{147}{189}$
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Conversion to an Equivalent Fraction Having a Higher Denominator

EXAMPLE—Express $\frac{3}{4}$ as an equivalent fraction in 48ths.

Multiply both numerator and denominator by 12, and $\frac{3}{4}$ becomes $\frac{36}{48}$.

2. Change to equivalent fractions with denominators as indicated.

(1) $\frac{11}{12} = \frac{\quad}{156}$	(2) $\frac{5}{9} = \frac{\quad}{117}$	(3) $\frac{7}{15} = \frac{\quad}{135}$	(4) $\frac{6}{7} = \frac{\quad}{161}$
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Addition of Fractions and Mixed Numbers

EXAMPLE 1— $\frac{2}{3} + \frac{3}{5} + \frac{5}{6}$

Express first with a common denominator—the L.C.M. of 3, 5, and 6, which is 30.

$$\frac{2}{3} + \frac{3}{5} + \frac{5}{6} = \frac{20 + 18 + 25}{30} = \frac{63}{30} = 2\frac{3}{10} = 2\frac{1}{10}.$$

EXAMPLE 2— $3\frac{2}{3} + 5\frac{3}{5} + 6\frac{5}{6}$

First, add the whole numbers: $3 + 5 + 6 = 14$.

Then, add the fractions as above: $\frac{2}{3} + \frac{3}{5} + \frac{5}{6} = 2\frac{1}{10}$.

Then, add the sums of both: $14 + 2\frac{1}{10} = 16\frac{1}{10}$.

3. Add as indicated.

(1) $12\frac{3}{4} + \frac{1}{2} + 13\frac{5}{8} + 28\frac{1}{3}$	(2) $13\frac{2}{7} + 16\frac{1}{4} + 10\frac{1}{2} + 8\frac{1}{3}$
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SUBTRACTION AND MULTIPLICATION OF FRACTIONS

Subtraction of Fractions and Mixed Numbers

EXAMPLE 1— $\frac{2}{3} - \frac{3}{5} = \frac{10 - 9}{15} = \frac{1}{15}$

EXAMPLE 2— $8\frac{3}{5} - 6\frac{2}{3} = 8\frac{9}{15} - 6\frac{10}{15}$.

Since $\frac{10}{15}$ is greater than $\frac{9}{15}$, borrow $\frac{15}{15}$ (1) from the 8 and add to the $\frac{9}{15}$.

Then we have $7\frac{24}{15} - 6\frac{10}{15} = 1\frac{14}{15}$.

1. Subtract as indicated.

(1) $\frac{13}{16} - \frac{5}{12}$	(2) $11\frac{3}{4} - 6\frac{2}{3}$	(3) $10\frac{5}{8} - 5\frac{7}{8}$	(4) $1\frac{1}{2} - \frac{2}{3}$
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Multiplication of Fractions

EXAMPLE 1— $\frac{3}{5} \times \frac{15}{16} = \frac{3}{5} \times \frac{1\cancel{5}}{16} = \frac{9}{16}$

NOTE: Cancel numerators and denominators when possible before multiplying numerators together and denominators together.

EXAMPLE 2— $2\frac{1}{4} \times 4\frac{1}{3} = \frac{9}{4} \times \frac{13}{3} = \frac{39}{4} = 9\frac{3}{4}$

NOTE: First turn to improper fractions and then proceed as in Example 1.

EXAMPLE 3— $24 \times 12\frac{1}{2}$

$$\begin{array}{r} 24 \\ 12\frac{1}{2} \\ \hline 288 \\ 12 \\ \hline 300 \end{array}$$

Multiply by the 12, then by the $\frac{1}{2}$, and add.
See the solution to the right.

2. Multiply as indicated.

(1) $\frac{3}{16} \times \frac{8}{9}$	(2) $9\frac{1}{3} \times 4\frac{2}{3}$	(3) $12\frac{3}{4} \times 5\frac{1}{3}$	(4) $6\frac{1}{4} \times 1\frac{1}{15}$
(5) $1256 \times 98\frac{1}{4}$	(6) $8756\frac{2}{3} \times 96$		

Division of Fractions

EXAMPLE 1— $\frac{2}{3} \div \frac{5}{6} = \frac{2}{3} \times \frac{6}{5} = \frac{4}{5}$

NOTE: Invert the divisor, and proceed as in multiplication.

EXAMPLE 2— $2\frac{1}{2} \div 3\frac{1}{2} = \frac{5}{2} \times \frac{2}{7} = \frac{5}{7}$

NOTE: Change to improper fractions first, and then proceed as in Example 1.

1. Divide as indicated.

(1) $\frac{8}{9} \div \frac{2}{3}$	(2) $11\frac{1}{4} \div 4\frac{1}{8}$	(3) $21\frac{3}{5} \div 10$	(4) $95 \div 6\frac{1}{3}$
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Mixed Operations

Mixed operations must be performed according to the proper sequence of signs. The order is as follows:

1. Bracketed expressions are done first.
2. Expressions joined by "of" are multiplied.
3. Multiplication and division come next in order of occurrence.
4. Addition and subtraction are done last in order of occurrence.

2. Perform the following mixed operations.

(1) $\frac{2}{3} \times \frac{1}{2} + \frac{1}{8}$	(2) $\frac{2}{3} \times \left(\frac{1}{2} + \frac{1}{8}\right)$	(3) $\frac{2}{3}$ of $\left(\frac{6}{11} - \frac{5}{33}\right)$	(4) $\frac{2}{3}$ of $\frac{6}{11} - \frac{5}{33}$
(5) $\frac{3}{4}$ of $\frac{5}{6} + \frac{3}{4} \times \frac{4}{5} - \frac{7}{8}$		(6) $\frac{3}{4}$ of $\left(\frac{5}{6} + \frac{3}{4}\right) \times \frac{4}{5} - \frac{7}{8}$	

COMPLEX FRACTIONAL EXPRESSIONS

The numerator and the denominator of the complex fraction must be simplified separately before one can be divided by the other.

EXAMPLE—

$$\frac{\frac{1}{2} + \frac{1}{4}}{\frac{1}{3} - \frac{1}{6}} = \frac{\frac{3}{4}}{\frac{1}{6}}$$

$$\frac{3}{4} \div \frac{1}{6} = \frac{3}{4} \times \frac{6}{1} = \frac{9}{2} = 4\frac{1}{2}$$

1. Simplify the following complex fractional expressions.

(1) $\frac{\frac{3}{8}}{\frac{9}{10}}$	(2) $\frac{8\frac{1}{2}}{3\frac{1}{4} - 1\frac{1}{8}}$	(3) $\frac{5\frac{2}{3} \div \frac{3}{5}}{3}$	(4) $\frac{\frac{1}{3} \text{ of } 5\frac{1}{2}}{\frac{1}{2} \text{ of } \frac{1}{8}}$
(5) $\frac{1\frac{1}{3} + \frac{3}{10}}{2 - 1\frac{3}{5}} + \frac{3}{8} \text{ of } 5\frac{1}{2}$		(6) $\frac{2\frac{1}{4} \times (3\frac{1}{2} + 1\frac{1}{3})}{\frac{1}{12} \div \frac{3}{4}} \text{ of } \frac{1\frac{2}{3}}{1\frac{1}{3}}$	

PROBLEMS INVOLVING OPERATIONS WITH FRACTIONS

Set up clearly expressed solutions for the following problems.

1. A farmer sold $24\frac{1}{2}$ acres of a $73\frac{1}{2}$ acre farm. What fraction of his farm did he sell?

2. How much more pay is received by a man who worked $43\frac{1}{2}$ hours at $\$1.10\frac{1}{2}$ an hour than by a man who worked $52\frac{1}{2}$ hours at $80\frac{1}{2}$ cents an hour?

3. The owner of a store bought $49\frac{3}{4}$ yards of silk at $\$1.98$ a yard. He sold $13\frac{3}{4}$ yards at $\$2.35$ a yard, $\frac{5}{8}$ of the remainder, at $\$2.48$ a yard; and the balance, at $\$1.87\frac{1}{2}$ a yard. Find his gain.

4. A dry goods firm bought 498 yards of material at $62\frac{1}{2}$ cents a yard. Half of it was sold at 98 cents a yard; one-third of it was sold at 75 cents a yard; half of the remainder, at 68 cents a yard; and the balance, at 49 cents a yard. (a) What was the average selling price per yard? (b) What was his profit?

PROBLEMS INVOLVING OPERATIONS WITH FRACTIONS

5. A piece of goods contained $39\frac{3}{4}$ yards. If $\frac{5}{8}$ of the piece was sold, how many yards remained unsold?

6. What quantity taken from $18\frac{7}{8}$ will make it exactly divisible by $6\frac{1}{4}$?

7. A total of $48\frac{2}{3}$ pounds of tea were bought at $63\frac{3}{4}$ cents a pound. How many more pounds would have been received for the same money if the price had been $7\frac{1}{2}$ cents a pound less?

8. A dealer bought 46 bales of goods, averaging 430 pounds a bale, at $11\frac{1}{2}$ cents a pound, and sold the entire quantity at $12\frac{3}{4}$ cents a pound. If the expenses of the sale were \$83.20, how much profit did he make?

9. Find the total cost of the following articles: $2\frac{3}{4}$ dozen buttons at 12 cents a dozen, $8\frac{1}{4}$ yards of ribbon at 32 cents a yard, $3\frac{1}{2}$ yards of lace at 60 cents a yard, and $\frac{1}{4}$ yard of cloth at \$2.60 a yard.

PROBLEMS INVOLVING OPERATIONS WITH FRACTIONS

In the space to the left, draw a neat sketch in reasonable proportion to illustrate the problem. Insert measurements neatly. Set up your solution in the space to the right. Calculations may be completed on a scratch pad.

1. A circle $7\frac{1}{8}$ inches in diameter has a border $4\frac{3}{16}$ inches wide all around it. What is the outside diameter?

2. A picture $3\frac{5}{8}$ inches by $7\frac{1}{4}$ inches has a $2\frac{1}{4}$ -inch border on all sides and a frame $1\frac{7}{8}$ inches wide. Find the outside dimensions.

3. The printed part of the page of a book measures $5\frac{3}{4}$ inches by $7\frac{7}{8}$ inches. It has a $1\frac{1}{8}$ -inch margin at the top, a $\frac{3}{4}$ -inch margin at the bottom, and a $\frac{7}{16}$ -inch margin on each side. Find the overall dimensions of the page.

PROBLEMS INVOLVING OPERATIONS WITH FRACTIONS

4. The outside measurements of a box (open top) are $7\frac{3}{8}$ inches wide by $11\frac{1}{4}$ inches long, by $4\frac{7}{16}$ inches high. The wood is $\frac{3}{16}$ of an inch thick. Find the inside measurements.

5. A rectangle is $7\frac{1}{4}$ inches by $12\frac{1}{2}$ inches. A circle cut out at its centre has a diameter of $5\frac{3}{4}$ inches. What will be the remaining widths at the sides and ends?

6. A room 12 feet $4\frac{1}{2}$ inches long has a rug 10 feet 6 inches long placed in the middle. What is the measurement of the uncovered floor at each end?

GENERAL PRACTICE IN FUNDAMENTAL OPERATIONS

1. Add the following columns of figures both vertically and horizontally, and prove by totals.

	(1)	(2)	(3)	(4)	(5)	TOTAL
1	6 8 3 2 4 9	3 2 6 9 5	7 8 6 3 2	8 9 7 6 5	7 3 4 9 2	
2	7 8 6 3 2	1 7 2 6 3 8	1 6 4 5 1 7	1 3 6 4 7 5	1 9 6 5 3 8	
3	4 2 9 8 3 6	9 2 9 1 3 3	1 3 7 4 6 9	7 8 9 1 2	8 6 5 3 4	
4	6 3 2 1 7 4	7 9 6 3 5	9 7 5 4 1	2 3 6 4 7 5	1 9 7 8 5 6	
5	4 7 6 3 2 7	5 2 1 6 8 5	7 5 5 6 6	3 6 5 4 8 7	9 2 7 8 6 3	
6	8 9 6 3 7 5	1 4 2 9 3 6	3 5 2 7 4 6	4 7 6 5 8	3 4 9 5 6 5	
7	9 3 2 9 3 7	6 9 7 4 8	6 8 4 1 2	5 7 4 6 8 7	8 7 5 6 3	
8	6 7 4 9 3	5 2 6 3 4 7	1 6 3 4 7 7	6 9 7 8 4 3	4 2 1 8 6	
9	5 2 7 6 3	7 2 6 3 4	7 2 4 7 1 8	5 2 1 3 4	7 2 8 4 5	
10	1 8 7 2 5 9	1 6 3 9 5 2	9 6 3 4 6	1 4 3 5 2 6	1 6 3 7 3 2	
Tot.						

2. Multiply as indicated. Prove by totals.

(1)										(2)																			
1	2 4 6 8 × 1 2 ==														1	1 9 8 7 2 × 1 2 ==													
2	9 7 6 3 × 1 2 ==														2	2 5 7 6 4 × 1 2 ==													
3	1 4 7 3 5 × 1 2 ==														3	3 4 5 6 7 × 1 2 ==													
4	6 5 9 3 7 × 1 2 ==														4	8 3 2 7 4 × 1 2 ==													
5	2 7 6 8 4 × 1 2 ==														5	6 5 9 3 2 × 1 2 ==													
6	3 8 7 5 2 × 1 2 ==														6	7 3 5 9 8 × 1 2 ==													
Tot.	× 1 2 ==														Tot.	× 1 2 ==													

3. Divide as indicated. Prove by totals.

(1)										(2)											
1	4 3 5 9 2 4 ÷ 1 2 ==										1	4 7 2 4 1 6 ÷ 1 2 ==									
2	3 4 7 5 5 6 ÷ 1 2 ==										2	8 8 4 2 2 0 ÷ 1 2 ==									
3	5 1 4 3 8 0 ÷ 1 2 ==										3	9 9 3 2 2 8 ÷ 1 2 ==									
4	6 7 6 7 4 0 ÷ 1 2 ==										4	4 4 3 2 5 6 ÷ 1 2 ==									
5	5 7 1 6 6 8 ÷ 1 2 ==										5	7 7 6 9 7 6 ÷ 1 2 ==									
6	8 8 7 0 8 8 ÷ 1 2 ==										6	4 5 4 4 2 8 ÷ 1 2 ==									
Тот.	÷ 1 2 ==										Тот.	÷ 1 2 ==									

UNIT 3

FUNDAMENTAL OPERATIONS WITH DECIMALS

RELATIONSHIP OF DECIMALS AND FRACTIONS

A decimal is a fractional part of some power of 10; for example, $.1 = 1/10$; $.01 = 1/100$; $.001 = 1/1000$. Therefore, decimals may be expressed as fractions, and fractions as decimals.

Expressing Decimals as Fractions

EXAMPLE—Express $.27$, $.027$, 2.27 as fractions.

$$.27 = \frac{27}{100}; \quad .027 = \frac{27}{1000}; \quad 2.27 = 2\frac{27}{100}$$

1. Express the following decimals as fractions in their lowest terms.

(1) $.225$	(2) $.0032$	(3) 3.025	(4) 14.250
(5) $.375$	(5) $.37\frac{1}{2}$	(7) $.33\frac{1}{3}$	(8) $.66\frac{2}{3}$

Expressing Fractions as Decimals

EXAMPLE 1— Express $\frac{3}{4}$ as a decimal.

$$\begin{array}{r} .75 \\ \text{Divide the numerator by the denominator—} 4 \overline{)3.00} \\ \text{Hence, } \frac{3}{4} = .75 \end{array}$$

EXAMPLE 2— Express $\frac{2}{3}$ as a decimal.

$$\begin{array}{r} .666\frac{2}{3} \\ \text{Divide the numerator by the denominator—} 3 \overline{)2.000} \\ \text{Hence, } \frac{2}{3} = .666\frac{2}{3} \text{ or } .667 \text{ (correct to 3 places)} \end{array}$$

NOTE: For convenience in calculation, the fractional part of a decimal is often dropped, and the closest inexact decimal written instead. Thus, $.667$ is closer to $.66\frac{2}{3}$ than is $.666$; similarly, $.333$ is closer to $.33\frac{1}{3}$ than is $.334$. The approximation is made according to the number of decimal places required; thus, $.66\frac{2}{3}$, correct to 1 place, is $.7$; to 2 places, $.67$; to 3 places, $.667$; etc. Note, however, that $.325$, correct to 2 places is $.33$, and $.2456$ correct to 3 places is $.246$.

2. Express the following fractions as decimals correct to 3 places.

(1) $\frac{3}{8}$	(2) $\frac{3}{25}$	(3) $\frac{5}{6}$	(4) $8\frac{5}{8}$
(5) $25\frac{1}{5}$	(6) $\frac{9}{16}$	(7) $\frac{3}{40}$	(8) $\frac{7}{12}$

ADDITION, SUBTRACTION, AND MULTIPLICATION OF DECIMALS

Addition and Subtraction of Decimals

When writing numbers containing decimals for either addition or subtraction, keep the decimal points in vertical alignment.

EXAMPLE 1— $24.01 + .0225 = 24.0325$

EXAMPLE 2— $24.01 - .0225 = 23.9875$

1. Add and subtract as indicated.

(1) $69 + .03 =$	(6) $69 - .03 =$
(2) $.69 - .3 =$	(7) $6.90 + .003 =$
(3) $6.9 - .3 =$	(8) $.69 - .003 =$
(4) $6.9 + 30 =$	(9) $.069 - .0003 =$
(5) $.069 + .003 =$	(10) $.069 + 3 =$

Multiplication of Decimals

EXAMPLE 1— $5 \times .5 = 2.5$

2— $.5 \times .5 = .25$

3— $.05 \times .05 = .0025$

NOTE: The product contains as many decimal places as is contained in both factors together.

2. Multiply as indicated.

(1) $69 \times .03 =$		(6) $144 \times 1.2 =$	
(2) $.069 \times 3 =$		(7) $1.44 \times .12 =$	
(3) $6.9 \times 30 =$		(8) $.144 \times 12 =$	
(4) $6.90 \times 3.0 =$		(9) $14.40 \times .012 =$	
(5) $.69 \times .003 =$		(10) $1.44 \times .0012 =$	
(11) $.0625 \times 6.16$	(12) 98.75×29.7	(13) 4.287×3.65	(14) $.06125 \times .0807$

3. Find the cost to the nearest cent.

(1) $256\frac{1}{2}$ pounds @ \$1.25 =

(4) $189\frac{3}{4}$ pounds @ \$.87 $\frac{1}{2}$ =

(2) $163\frac{3}{4}$ pounds @ 1.32 =

(5) $242\frac{1}{2}$ pounds @ .35 $\frac{1}{2}$ =

(3) $183\frac{1}{4}$ pounds @ 1.17 =

(6) $136\frac{1}{4}$ pounds @ .62 $\frac{1}{2}$ =

DIVISION OF DECIMALS

- (1) When the divisor is a whole number, divide as in ordinary division.

EXAMPLE
$$\begin{array}{r} .075 \\ 5 \overline{) .375} \end{array}$$

- (2) When the divisor is a decimal, make it a whole number by moving the decimal point to the right of the number. Then, move the decimal point in the dividend the same number of places to the right.

EXAMPLE 1—
$$\begin{array}{r} 7.5 \\ .05 \overline{) .375} = 5 \overline{) 37.5} \end{array}$$

2—
$$\begin{array}{r} 750 \\ .0005 \overline{) .375} = 5 \overline{) 3750} \end{array}$$

3—
$$\begin{array}{r} 1.5 \\ .12 \overline{) .18} = 12 \overline{) 18.0} \end{array}$$

1. Divide as indicated:

(1) $100.8 \div 1.2$		(6) $3.105 \div .9$	
(2) $10.08 \div 12$		(7) $.3105 \div .09$	
(3) $1.008 \div .12$		(8) $310.5 \div 9$	
(4) $.01008 \div .012$		(9) $31.05 \div .009$	
(5) $.1008 \div .0012$		(10) $.03105 \div .9$	

2. Divide by long division to three decimal places.

(1) $12.8 \div 1.71$	(2) $625 \div 365$	(3) $125 \div 12.75$
(4) $3.25 \div 13.25$	(5) $2.1 \div 1.416$	(6) $32.4 \div 18.2$

MIXED OPERATIONS WITH FRACTIONS AND DECIMALS

In order to simplify expressions containing both common fractions and decimal fractions, it is necessary to convert all numbers to either common fractions or decimal fractions, whichever is the easier, and then express the answer as required.

EXAMPLE 1— Add $.75$ and $\frac{3}{8}$ and show the sum as a common fraction.

$$.75 + \frac{3}{8} = \frac{75}{100} + \frac{3}{8} = \frac{3}{4} + \frac{3}{8} = 1\frac{1}{8}$$

EXAMPLE 2— Add $.75$ and $\frac{3}{8}$ and show the sum as a decimal fraction.

$$.75 + \frac{3}{8} = .75 + .375 = 1.125$$

Or add as in Example 1, and express the sum $1\frac{1}{8}$ as a decimal fraction— $1\frac{1}{8} = 1.125$

1. Express the results for the following as common fractions.

(1) $.1 \times 25\frac{1}{2}$	(2) $\frac{1}{2} + .025$	(3) $5.66\frac{2}{3} - 3\frac{1}{3}$	(4) $\frac{.025}{\frac{1}{10}}$
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2. Express the results for the following as decimal fractions.

(1) $.0025 + \frac{4}{5}$	(2) $100\frac{3}{8} - 8.125$	(3) $.66\frac{2}{3} \times 4\frac{1}{2}$	(4) $13\frac{1}{2} \times 13\frac{1}{2}$
(5) $\frac{3}{8} \div 15$	(6) $8\frac{1}{4} \times .33\frac{1}{3}$	(7) $\frac{.1825}{\frac{1}{8}}$	(8) $\frac{5\frac{3}{4} \times 2.5}{\frac{1}{2}}$

THE USE OF DECIMALS AND FRACTIONS IN INVOICES

Extend and total each of the following invoices.

1. 48 yd. @ \$.75 a yd.						2. 4,250 ft. @ \$ 75.50 a M					
228 yd. @ .82½ a yd.						865 ft. @ 95.25 a M					
128 yd. @ .62½ a yd.						13,280 ft. @ 87.50 a M					
98 yd. @ .12½ a yd.						345 ft. @ 112.80 a M					
48 yd. @ .32½ a yd.						9,775 ft. @ 69.00 a M					
Total						Total					
3. 32,675 lb. @ \$16.25 a ton						4. 484 pcs. @ \$.15 a doz.					
14,596 lb. @ 15.75 a ton						275 pcs. @ .18 a doz.					
9,685 lb. @ 12.60 a ton						180 pcs. @ .16 a doz.					
23,485 lb. @ 10.85 a ton						375 pcs. @ .14 a doz.					
1,565 lb. @ 18.50 a ton						148 pcs. @ .18 a doz.					
Total						Total					
5. 47½ lb. @ \$.08 a lb.						6. 75 lb. @ \$1.85 a cwt.					
93¾ lb. @ .16 a lb.						128 lb. @ 2.15 a cwt.					
38¼ lb. @ .16 a lb.						32 lb. @ 1.90 a cwt.					
52½ lb. @ .12 a lb.						95 lb. @ 2.45 a cwt.					
75¾ lb. @ .09 a lb.						114 lb. @ 2.20 a cwt.					
Total						Total					
7. 10½ doz. @ \$15.00 a gross						8. 2½ ft. @ \$4.85 a yd.					
8¼ doz. @ 10.00 a gross						1¾ ft. @ 5.25 a yd.					
9½ doz. @ 14.00 a gross						1½ ft. @ 4.50 a yd.					
2¾ doz. @ 11.00 a gross						2¾ ft. @ 5.95 a yd.					
11¼ doz. @ 13.00 a gross						3½ ft. @ 4.85 a yd.					
Total						Total					

PROBLEMS INVOLVING OPERATIONS WITH DECIMALS

Prepare neat solutions for the following problems. Statements must be logical and clear.

1. A man sold .25 of his share in a business for \$7,500. What was the value of his share of the business before the sale?

2. If \$675 is paid for 7.5 acres of land, what is the price of an acre?

3. A school pays \$5.50 for a gross of pencils. What is the cost of one pencil?

4. A church requires 54.5 yards of carpet for the aisles. What is the total cost, at \$4.85 a yard?

5. A contractor employs 14 men for an 8-hour day at 95.5 cents an hour. What is his daily payroll?

6. A man drove his car 4,098 miles, using 248 gallons of gasoline. What was the average mileage per gallon. (Calculate to 3 decimal places.)

PROBLEMS INVOLVING OPERATIONS WITH DECIMALS

7. If the gasoline used in Problem 6 on the preceding page cost 42.5 cents a gallon, what was the cost of gasoline per mile? (Calculate to 3 decimal places).

8. In a test, an automobile travelled 28 miles in 30 minutes. At this rate, how many miles would it travel in 6.25 hours?

9. If gunpowder consists of .15 sulphur, .1 saltpeter and .75 charcoal, how many pounds of each are there in 1920 pounds of gunpowder?

10. A leak in a water tank caused a loss of 2.25 gallons a day. If the tank contained 875.375 gallons, how many gallons remained in the tank at the end of 30 days?

PRACTICE IN FUNDAMENTAL OPERATIONS WITH DECIMALS

1. Copy the following figures in the spaces provided, and add.

- (1) .062, 265.91, 68, .5, 1.6824, 18.9
- (2) .9, 285.8, 3.568, 27.8, .57, 9.6
- (3) 84, 7.635, .9, 46.27, 1.628, 19.8
- (4) 4.639, 526, .789, 2.9, 15.76, 3.892
- (5) 62.7, 9.375, .895, 87, 96, 1.89
- (6) .087, 36, 9.7, 86.325, 9.75, .097

[illegible]

2. Copy the following figures in the spaces provided, and subtract.

- (1) $162.05 - 27.629$ (2) $824.01 - 49.6$ (3) $127 - 88.99$ (4) $375.52 - 96.8$
(5) $752 - 187.98$ (6) $523.001 - 64.109$

(6)

3. Multiply as indicated.

(1) 2.6385 by .06		(6) .00637 by 1.1	
(2) 8.276 by .09		(7) 2.0198 by .12	
(3) 326.54 by .11		(8) 167.84 by .09	
(4) 9634.7 by .8		(9) 98.637 by .8	
(5) 16.485 by 1.2		(10) 42.875 by .07	

4. Divide as indicated.

(1) .162792 by 1.2		(6) .042255 by .9	
(2) 796.840 by 1.1		(7) .063736 by .08	
(3) 8.86788 by .09		(8) 952.490 by .11	
(4) 65986.4 by .08		(9) .076644 by .12	
(5) 65685.2 by .07		(10) 8888.40 by .09	

UNIT 4

PROBLEMS IN PROPORTION

EXAMPLE—If 12 eggs cost 54 cents, what is the cost of 10 eggs?

Each of the following forms of solution are in common use. Use the form which seems the easier in any particular case.

SOLUTION 1

12 eggs cost 54 cents.

1 egg costs $\frac{54}{12}$ cents.

10 eggs cost $\frac{10 \times 54}{12}$, or 45 cents.

SOLUTION 2

12 eggs cost 54 cents.

10 eggs cost $10/12$ as much as 12 eggs.

$10/12$ of 54 cents, or 45 cents.

Complete solutions for the following problems.

1. What is the value of 32 bushels of potatoes if 10 bushels cost \$45.00?

2. If 8 tons of coal cost \$212, what is the cost of 3 tons?

3. If 10 dozen oranges cost \$4.50, what is the cost of 50 oranges?

4. If $1\frac{1}{2}$ dozen pencils cost 90 cents, how many pencils can be bought for \$1.50?

5. Two miles in 6 minutes is how many feet in 10 seconds?

6. At 60 miles an hour, how long does it take to travel 100 yards?

PROBLEMS IN PROPORTION

7. If 3 yards of material cost 84 cents, how many yards are worth 64 cents?

8. If 45 articles can be packed in 25 minutes, how long does it take to pack 9 articles?

9. If 7 pounds of flour cost 28 cents, find the value of 10 cups of flour.
(1 lb. = $3\frac{1}{3}$ cups)

10. If 10 pounds of sugar cost 85 cents, what is the value of $2\frac{1}{2}$ cups of sugar?
(1 lb. = 2 cups)

11. Find the cost of 3 ounces of spice at 32 cents a half-pound.

12. If one gallon of paint covers 150 square feet of surface, how many quarts are required to cover 275 square feet?

13. If you can drive 22 miles on one gallon of gasoline, find the cost of gasoline used on a trip of 60 miles at 42 cents a gallon.

14. At the rate of \$1.50 a thousand, what is the cost of 5,250 articles?

PROBLEMS IN PROPORTION

15. If 8,000 units cost \$24.00, what is the cost of .08 thousand units?

16. If .6275 of an acre of land is worth \$725, what is .8275 of an acre worth?

17. If $\frac{5}{24}$ of an estate is valued at \$50,000, what is the value of the estate?

18. What is the height of a tower if .8 of its height is 56 feet?

19. The selling price of an article was \$120. This was $1\frac{3}{5}$ times the cost. Find the cost.

20. An article was sold for \$140, showing a profit of $\frac{1}{4}$ of the cost. Find the cost.

21. A person who owned a half-interest in a business sold $\frac{1}{3}$ of his share to his partner for \$5,000. What was the whole business worth at this rate?

22. Divide \$28 between two persons, giving one $2\frac{1}{2}$ times as much as the other.

PROBLEMS IN PROPORTION

23. A man sold his car for \$1,500, which was $\frac{3}{4}$ of its original cost. What was the original cost?

24. A merchant sold goods for \$360, which was $1\frac{1}{3}$ times the cost of the goods. What was the cost?

25. When goods were sold for \$840, a profit of $\frac{1}{5}$ of the cost was realized. What was the cost?

26. Divide \$17.50 between two persons, giving one person \$3 for every \$2 given to the other.

27. A invested \$5,000 in a business and B, \$8,000. Divide a profit of \$3,900 between them in proportion to their investments.

28. Divide \$1,800 between A, B and C in the proportion of 5, 6 and 7, respectively.

29. A partner who owned $\frac{1}{2}$ of a business sold $\frac{1}{2}$ of his share to the other partner for \$5,000. At this rate, what was the business worth?

30. A tank $\frac{2}{3}$ full contains 8 gallons of gasoline. How much does it contain when it is $\frac{1}{4}$ full?

PROBLEMS IN PROPORTION

31. A man who owned a $\frac{2}{5}$ share in a business sold $\frac{1}{4}$ of his share for \$12,000. At this rate, what was the value of the business?

32. A man who owned $\frac{3}{4}$ of a farm sold $\frac{2}{5}$ of his share for \$2,100. At this rate, what was the whole farm worth?

33. A merchant sold a machine for \$1,099.20, gaining $\frac{1}{6}$ of its cost. What was the cost?

34. A diamond ring cost \$270. The diamond was worth $3\frac{1}{2}$ times as much as the setting. Find the value of each.

35. By selling an article for \$81.60, a dealer made a profit of $\frac{1}{3}$ of the cost. What was the cost?

36. A man who owned $\frac{1}{3}$ of a business sold $\frac{1}{4}$ of his share for \$2,400. What was the business worth at this rate?

37. A refrigerator was sold at a reduction of $\frac{1}{3}$ of the cost. If the selling price was \$180, what was the cost?

38. Find the profit on an article that cost 30 cents a dozen, and was sold at 10 for 25 cents.

GENERAL PRACTICE IN FUNDAMENTAL OPERATIONS

Add the following. Check your addition carefully.

1.	2.	3.	4.	5.	6.	7.	8.
385.85	645.38	574.95	342.56	834.82	973.92	694.35	583.25
745.36	486.29	573.97	285.45	673.93	598.57	385.65	867.45
863.27	168.46	745.54	586.98	535.24	386.45	286.95	175.85
586.24	463.97	473.76	264.45	865.74	485.54	867.34	275.75
468.34	968.56	465.45	867.45	254.38	924.47	946.37	984.85
743.86	246.79	468.94	684.35	797.24	685.38	295.74	938.38
574.38	926.48	365.84	385.92	296.47	948.36	364.72	958.63
584.56	246.89	235.65	468.35	214.47	418.38	126.96	915.63
639.25	573.89	158.36	216.48	693.19	941.73	584.91	932.75
857.25	346.79	653.65	975.38	739.95	878.25	425.35	334.52
147.84	419.31	419.46	148.94	173.26	195.43	312.48	412.85
614.12	519.36	149.35	594.12	594.35	694.36	138.28	538.21

9.	10.	11.	12.	13.	14.	15.	16.
145.27	418.28	485.19	438.12	857.94	684.29	483.67	147.28
342.45	543.67	268.94	368.36	258.48	964.32	756.35	856.28
536.78	865.36	479.26	479.35	864.29	748.36	356.35	355.44
577.47	158.33	685.55	798.55	336.27	578.77	742.22	668.49
338.28	114.37	511.69	488.66	884.93	499.11	285.94	574.33
584.39	243.33	686.49	485.79	593.53	765.39	786.66	993.28
744.55	884.38	993.27	885.55	684.33	227.22	965.48	554.37
746.38	385.37	859.26	486.28	847.37	947.75	867.35	946.25
157.49	415.38	495.12	158.29	919.84	168.35	962.65	873.75
147.85	194.95	846.25	254.85	573.59	264.68	854.32	857.49
937.15	958.36	372.48	158.39	374.26	857.49	362.43	958.12
937.98	967.57	867.47	463.25	756.45	254.36	756.48	352.57

17.	18.	19.	20.	21.	22.	23.	24.
158.23	986.45	114.24	574.38	564.33	465.54	867.57	987.67
463.24	456.36	867.45	986.56	354.67	926.47	957.24	158.48
857.69	483.38	584.39	269.47	158.38	941.75	196.46	251.48
583.29	473.52	851.52	537.25	483.25	951.65	955.55	274.38
948.15	158.38	986.35	257.75	975.65	948.35	537.46	914.31
859.14	957.36	574.48	473.25	853.48	294.35	558.33	664.38
148.11	263.48	947.37	847.36	295.47	853.51	947.76	338.66
992.35	855.47	668.44	884.22	934.77	221.88	174.28	751.92
194.26	418.88	332.55	883.55	967.23	847.36	592.48	948.13
875.54	947.26	748.35	621.98	517.24	463.58	319.65	268.65
147.27	463.35	485.92	591.76	694.36	732.98	824.36	936.65
226.78	284.38	594.19	257.19	583.26	774.33	994.88	294.37

UNIT 5

PERCENTAGE

RELATIONSHIP OF PER CENTS AND FRACTIONS

Per Cents as Fractions; Fractions as Per Cents

The term per cent means per hundred or hundredths. A per cent, therefore, is a fraction of 100.

EXAMPLE—25 per cent (written as 25%) = $\frac{25}{100} = \frac{1}{4}$

Conversely, to express a fraction as a per cent, reverse the procedure; that is, multiply the fraction by 100.

EXAMPLE— $\frac{1}{4}$ expressed as a per cent is $\frac{1}{4}$ of 100, or 25%.

The following table of aliquot parts (factors) of 100 is given to facilitate the conversion of fractions to per cents and per cents to fractions. The figures inserted in the table are the per cent equivalents of fractions, the numerators of which are in the vertical column to the left, and the denominators of which are written horizontally at the top of the other vertical columns; that is, $\frac{1}{2} = 50\%$, $\frac{1}{3} = 33\frac{1}{3}\%$, $\frac{1}{4} = 25\%$. Complete the table to the right of the heavy line, following the pattern of the three lines already completed.

ALIUOT PARTS OF 100

NUMER- ATOR	HALVES	THIRDS	FOURTHS	FIFTHS	SIXTHS	EIGHTHS	TENTHS	TWELFTHS	SIX- TEENTHS
1	50%	33 $\frac{1}{3}$ %	25%	20%	16 $\frac{2}{3}$ %	12 $\frac{1}{2}$ %	10%	8 $\frac{1}{3}$ %	6 $\frac{1}{4}$ %
2	100%	66 $\frac{2}{3}$ %	50%	40%	33 $\frac{1}{3}$ %	25%	20%	16 $\frac{2}{3}$ %	12 $\frac{1}{2}$ %
3		100%	75%	60%	50%	37 $\frac{1}{2}$ %	30%	25%	18 $\frac{3}{4}$ %
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									

RELATIONSHIP OF PER CENTS AND DECIMALS

1. Express the following per cents as fractions in their lowest terms.

(1) $87\frac{1}{2}\%$	(2) $33\frac{1}{3}\%$	(3) 120%	(4) $6\frac{1}{4}\%$	(5) $\frac{1}{2}\%$	(6) $\frac{3}{4}\%$	(7) $\frac{1}{8}\%$

2. Express the following fractions as per cents.

(1) $\frac{1}{5}$	(2) $\frac{15}{16}$	(3) $\frac{7}{8}$	(4) $1\frac{1}{4}$	(5) $\frac{3}{400}$	(6) $\frac{1}{6}$	(7) $\frac{1}{125}$

Per Cents as Decimals; Decimals as Per Cents

To express a per cent as a decimal, merely place a decimal point two places to the left.

EXAMPLE— $25\% = \frac{25}{100}$; therefore, $25\% = .25$.

Conversely, to express a decimal as a per cent, merely place a decimal point two places to the right; for example, $.25 = 25\%$.

3. Express the following per cents as decimals.

No.	PER CENT	DECIMAL
1	$12\frac{1}{2}\%$	
2	100%	
3	$\frac{1}{4}\%$	
4	$.5\%$	
5	2.5%	
6	$33\frac{1}{3}\%$	
7	175%	
8	$\frac{1}{8}\%$	
9	30%	

4. Express the following decimals as per cents.

No.	DECIMAL	PER CENT
1	.375	
2	.05	
3	$.16\frac{2}{3}$	
4	2.0	
5	.0025	
6	$.06\frac{1}{4}$	
7	.125	
8	$.8\frac{1}{3}$	
9	.020	

EQUIVALENTS

Write the equivalents in the blank spaces provided.

No.	FRACTION	DECIMAL	PER CENT	No.	FRACTION	DECIMAL	PER CENT
1	$\frac{3}{5}$			27			$10\frac{1}{2}\%$
2		.5		28	$\frac{5}{16}$		
3			$3\frac{1}{2}\%$	29		.24	
4	$\frac{3}{8}$			30			.25%
5		.125		31	$\frac{5}{12}$		
6			12%	32		.015	
7	$\frac{3}{16}$			33			$\frac{3}{4}\%$
8		.04		34	$1\frac{2}{3}$		
9			$12\frac{1}{2}\%$	35		1.75	
10	$\frac{4}{5}$			36			$1\frac{1}{8}\%$
11		.001		37	$\frac{5}{8}$		
12			$1\frac{1}{2}\%$	38		.075	
13	$\frac{3}{20}$			39			.5%
14		1.25		40	$\frac{11}{12}$		
15			$33\frac{1}{3}\%$	41		.003	
16	$\frac{5}{6}$			42			19%
17		.0025		43	$\frac{7}{16}$		
18			$66\frac{2}{3}\%$	44		.875	
19	$\frac{7}{10}$			45			32%
20		.3125		46	$1\frac{1}{6}$		
21			$2\frac{1}{2}\%$	47		.0325	
22	$\frac{1}{3}$			48			$62\frac{1}{2}\%$
23		$.08\frac{1}{4}$		49	$\frac{7}{8}$		
24			$5\frac{1}{4}\%$	50		.00125	
25	$2\frac{3}{4}$			51			$16\frac{2}{3}\%$
26		2.1		52	$\frac{9}{16}$		

CALCULATING A PER CENT OF A NUMBER

EXAMPLE—Calculate 25% of 24.

Either of the following three methods may be used.

(1)	(2)	(3)
By changing the per cent to a fraction:	By changing the per cent to a decimal:	By the 1% method:
25% of 24	25% of 24	100% of 24 = 24
$= \frac{25}{100}$ of 24 = 6	$= .25$ of 24 = 6	1% of 24 = .24
		25% of 24 = 25 \times .24 = 6

The choice of method should be determined by the ease with which it can be applied.

Calculate the following values in per cent. Use the most easily applied method.

(1) 10% of 1280	(2) 5% of 640	(3) $12\frac{1}{2}\%$ of 1080	(4) $\frac{1}{8}\%$ of 10,000
(5) $1\frac{1}{4}\%$ of 1680	(6) $\frac{1}{3}\%$ of 4600	(7) $33\frac{1}{3}\%$ of 930	(8) 40% of 1650
(9) 200% of 68.50	(10) $\frac{1}{2}\%$ of 48	(11) 102% of 18.50	(12) $62\frac{1}{2}\%$ of 1944
(13) $37\frac{1}{2}\%$ of 144	(14) $16\frac{2}{3}\%$ of 180	(15) 125% of 840	(16) $\frac{3}{4}\%$ of 1600

CALCULATING WHAT PER CENT ONE NUMBER IS OF ANOTHER

EXAMPLE — What per cent is \$25 of \$125?

Either of the following solutions may be used.

Method 1

$$\$125 = 100\%$$

$$\$1 = \frac{100}{125} \text{ per cent of } \$125$$

$$\begin{aligned} \$25 &= 25 \times \frac{100}{125} \text{ per cent of } \$125 \\ &= 20\% \end{aligned}$$

Method 2

$$\$125 = 100\%$$

$$\begin{aligned} \$25 &= \frac{25}{125} \text{ of } 100\% \\ &= 20\% \end{aligned}$$

Using the easier method, find what per cent the first number is of the second.

(1) \$180 of \$270	(2) 37½ lb. of 300 lb.	(3) 73 days of 365 days
(4) 42 hours of 1 week	(5) 6 feet of 10 yards	(6) 2 ounces of 1 pound
(7) 15 cwt. of 1 ton	(8) 12½ cents of \$1.00	(9) ¼ of ¾
(10) \$425 of \$850	(11) ⅔ of 1	(12) 12½ lb. of 75 lb.

CALCULATING THE NUMBER, KNOWING THE PER CENT

EXAMPLE — 25% of a number is 40. Find the number.

Either of the following methods may be used.

Method 1

$$25\% \text{ of the number} = 40$$

$$1\% \text{ of the number} = \frac{40}{25}$$

$$\begin{aligned} 100\% \text{ of the number} &= 100 \times \frac{40}{25} \\ &= 160 \end{aligned}$$

Method 2

$$25\% \text{ of the number} = 40$$

$$\begin{aligned} 100\% \text{ of the number} &= \frac{100}{25} \times 40 \\ &= 160 \end{aligned}$$

Using the easier method, complete the following calculations.

(1) \$12 is 8% of \$.	(2) \$160 is 40% of \$. . . .	(3) \$1.50 is 1½% of \$. . . .
(4) \$28 is 3½% of \$. . . .	(5) 15 cents is ⅓% of \$. . . .	(6) 25 cents is ¼% of \$. . . .
(7) 4 oz. is 20% of . . lb.	(8) 9 in. is 75% of . . ft.	(9) 320 rods is 62½% of . . miles.
(10) 10 acres is 16⅔% of acres	(11) 20 minutes is 33⅓% of hours.	(12) .36 is 2% of

PROBLEMS INVOLVING PERCENTAGE

Prepare solutions for the following problems.

1. A man's salary is \$3,200 a year. He spends 40% for food, 25% for rent, 10% for clothing, and 20% for miscellaneous items. The rest is saved. (a) What per cent is saved? (b) How much is spent for each item? (c) How much is saved?

2. In 1950 a certain factory produced 525 airplanes. In 1954 it produced 1155 airplanes. What rate in per cent of the 1950 production was the increase in 1954?

3. A department store employs 84 men, 108 women, 36 girls and 12 boys. What per cent is each group of the total number employed?

4. The total enrolment of a school is 1,250 pupils. If 62% of the enrolment is girls, how many boys are enrolled in the school?

PROBLEMS INVOLVING PERCENTAGE

5. A family spent \$1,500 for food in one year. If this was 40% of the income, what was the income?

6. A man paid \$285 for a refrigerator after receiving a 5% reduction off the sale price. What was the original sale price?

7. On the principle that only 25% of the family income should be spent for rent, what monthly income would be necessary to allow for the payment of a monthly rental of \$75?

8. A worker's wages were raised from \$1.20 an hour to \$1.36 an hour. What was the per cent increase per hour on the old rate?

9. During a year of 290 working days, a strike closed a factory for 58 days. What per cent of the working days was lost?

10. In one week \$35,000 was collected in a community fund drive. If this was 25% of the total objective, what was the objective?

GENERAL PRACTICE IN FUNDAMENTAL OPERATIONS

1. Add each of the following groups of figures both vertically and horizontally. Prove by totals.

	(1)					(2)					(3)					(4)					(5)					(6)					TOTAL																	
1			2	6	9	5		1	2	4	8	3				7	5	2				9	4	8	1		1	6	5	7	5				2	3	9	6										
2			1	4	9	6	3			8	7	9	8			1	7	5	9	6			3	4	5	6	5			9	7	5			1	6	8	7	4									
3		8	2	4	7	3	6			4	9	8	6	9		7	3	2	6	3	2		4	1	6	9	3	8		2	4	7	6	3	2		3	1	7	6	8	7						
4			4	6	3	9	4		2	6	3	8	4	6			9	8	2	7	7			8	6	3	3	3			9	4	2	2	4			8	7	5	6	9						
5				9	7	6	4				6	4	9	7				4	9	7	6				8	7	9	3			3	9	8	7			9	8	3	7								
6					9	7	2					5	6	8					8	4	7					9	3	6				7	3	8				6	2	1								
7			3	6	2	1	7				2	4	6	3	8			5	6	7	8	9			4	9	6	3	5			8	6	4	6	4			5	9	8	7	2					
8				9	6	8	3					6	9	3	8				7	3	5	5				6	3	5	4				2	9	9	2				7	2	1	9					
Tot.																																																

2. Write the equivalents in the blank spaces provided.

No.	FRACTION	DECIMAL	PER CENT	No.	FRACTION	DECIMAL	PER CENT
1	$\frac{2}{5}$			15			260%
2		.6		16	$\frac{3}{16}$		
3			80%	17		.325	
4	$\frac{1}{8}$			18			$43\frac{3}{4}\%$
5		.625		19	$\frac{5}{16}$		
6			87.5%	20		.5625	
7	$\frac{1}{12}$			21			$18\frac{3}{4}\%$
8		$.16\frac{2}{3}$		22	$1\frac{3}{4}$		
9			$83\frac{1}{3}\%$	23		1.875	
10	$\frac{1}{40}$			24			$112\frac{1}{2}\%$
11		.005		25	$\frac{3}{80}$		
12			$\frac{1}{4}\%$	26		.0125	
13	$2\frac{1}{2}$			27			.5%
14		2.75		28	$\frac{75}{80}$		

UNIT 6

BUSINESS APPLICATIONS OF PERCENTAGE

CASH DISCOUNT

A *cash discount* is a reduction allowed for payment of an invoice or bill before a specified date, or within a certain period of time. The terms of discount are usually stated on the invoice in abbreviated form; for example, 2/10, n/30, means that 2% discount will be allowed if the invoice is paid within 10 days from the date of the invoice, and that 30 days are allowed for the payment of the invoice if the discount is not taken.

The terms on which cash discount is allowed vary in respect to the per cent of discount allowed and the time within which the discount is allowed. One popular practice is to allow a discount for payment of an invoice by the end of the current month, with the understanding that the actual payment less the discount will be accepted up to the 10th of the succeeding month. These terms are stated as 2/10 E.O.M., or 1/10 E.O.M., as the case may be.

GOOD FRUIT CO. LTD. Wholesale Fruit and Vegetables Windsor, Ont.	
Sold to: Service Fruit Market, 10 Madison Square, Windsor, Ont.	June 5, 19__ Terms: 2/10, n/30
3 bushels Apples @ \$2.80 per bushel	
2 cases Oranges @ \$7.20 per case	

What amount will settle the above invoice on June 15, 19__?

2. According to the terms and dates given below, find the cash discount and the amount paid.

No.	AMOUNT OF INVOICE	DATE OF INVOICE	TERMS	DATE PAID	CASH DISCOUNT		AMOUNT PAID	
1	\$ 240.60	June 3, 19—	2/10, n/30	June 8, 19—				
2	1,145.00	June 8, 19—	1/30, n/60	June 30, 19—				
3	624.50	June 15, 19—	2/10, 1/30, n/60	June 30, 19—				
4	1,259.00	June 18, 19—	2/10 E.O.M.	July 5, 19—				
5	784.85	June 20, 19—	1/10 E.O.M.	June 30, 19—				
6	398.40	June 25, 19—	3/10, 2/30, n/60	June 30, 19—				
7	536.39	June 28, 19—	2/10, n/60	July 28, 19—				
8	850.25	June 5, 19—	2/10 E.O.M.	July 5, 19—				

TRADE DISCOUNT

A *trade discount* is a reduction in price given by a wholesaler or manufacturer to a retailer or dealer in the trade. The trade discount is usually based on a list price, which is the price at which the goods are listed in the catalogue or price lists through which the wholesaler or manufacturer advertises his products.

Changes in price are usually effected by changing the discount rate instead of the list price.

Trade discounts are often quoted in series; for example, 20% and 10%. The second discount may apply only on large orders, or it may represent a reduction in price. When more than one discount is allowed, the first is taken on the list price; the second, on the remainder; etc.

EXAMPLE— Calculate the net price to the retailer of an article listed at \$75, less discounts of 20% and 10%.

$$\begin{array}{rcl} \text{List price} & = & \$75.00 \\ \text{Less 20\% of \$75} & = & \underline{15.00} \\ & & 60.00 \\ \text{Less 10\% of \$60} & = & \underline{6.00} \\ \text{Net price} & = & \$54.00 \end{array}$$

Observe that the second discount is taken on the remainder after the first discount has been subtracted. A third discount would be based on the \$54.00

1. Calculate the net price in each of the following exercises, and show your solutions.

(1) List price, \$160.00, less 25% and 10%.

(2) List price, \$1,280.00, less 25% and 12½%.

(3) List price, \$42.00, less 33⅓% and 10%.

(4) List price, \$90.00, less 20%, 15% and 10%.

TRADE DISCOUNT

(5) List price, \$1,425.00; less 20%, 10% and 5%.

(6) List price, \$125.00, less 30% and 10%.

(7) List price, \$825.00, less 25%, 10% and 5%.

(8) List price, \$245.60, less 25%, 20% and 10%.

2. Calculate the net price for each of the following.

No.	LIST PRICE	TRADE DISCOUNT	NET PRICE		No.	LIST PRICE	TRADE DISCOUNT	NET PRICE	
1	\$ 288.00	20% and 10%			11	\$ 450.00	25%, 15%, 5%		
2	360.00	25% " 20%			12	550.00	40% and 10%		
3	432.00	33 $\frac{1}{3}$ % " 10%			13	225.00	30% " 20%		
4	630.00	25% " 12 $\frac{1}{2}$ %			14	75.00	10%, 10%, 5%		
5	136.00	30% " 25%			15	6.00	20% and 10%		
6	860.00	25% " 5%			16	80.00	15% " 15%		
7	140.00	15% " 10%			17	280.00	10%, 5%, 5%		
8	200.00	12 $\frac{1}{2}$ % " 5%			18	175.00	40%, 10%, 5%		
9	1,250.00	33 $\frac{1}{3}$ % " 25%			19	145.00	35% and 10%		
10	240.00	15% " 10%			20	298.00	25% " 5%		

TRADE AND CASH DISCOUNTS

Calculate the extensions and the net amount of the following invoices.

(1)

HOME & OFFICE FURNITURE COMPANY

Windsor, Ont.

Sold to: Office Supply Co.,
4100 Madison,
Windsor, Ont.

Date: February 1, 19__

Terms: 2/10, n/30

4 Desks No. 400 @ \$ 85.00

6 Desks No. 500 @ \$125.00

5 Tables No. 250 @ \$ 35.00

Less 25% and 20%

Net

The amount to settle the above invoice on February 10, 19__ would be \$_____

(2)

HARDWARE MANUFACTURING CO.

Windsor, Ontario

Sold to: Jones' General Store,
Harrisville, Nfld.

Date: March 10, 19__

Terms: 2/10 E.O.M.

4 gross Machine Bolts $\frac{5}{8}$ " x 6" @ \$7.20

Less 40% and 10%

4 doz. Screw Drivers @ \$6.60 a doz.

Less 20% and 10%

Net

The amount to settle the above invoice on April 5, 19__ would be \$_____

SINGLE DISCOUNT EQUIVALENT

A trade discount series can be expressed as a single discount.

EXAMPLE—Calculate the single discount equivalent to a discount series of 20% and 10%.

The list price is	100%
Less the discount of	20%
	= 80%
Less 10% of 80	8%
The Net price	= 72%

Observe that 100% has been reduced to 72%. The total discount is $100\% - 72\%$ or 28%.

Thus, a single discount of 28% is equivalent to a discount series of 20% and 10%.

1. Calculate the single discount equivalent of the following series. Show the solution in the space provided.

[illegible]

2. Which series represents the greater discount, and by how much?

No.	SERIES A	SERIES B	GREATER SERIES	DIFFERENCE
1	20% and 10%	15% and 15%		
2	25% and 20%	30% and 15%		
3	10% and 10%	15% and 5%		
4	20%, 10%, and 5%	15%, 15% and 5%		
5	50% and 20%	40% and 30%		
6	10%, 10%, and 10%	20%, 5%, and 5%		

PROFIT AND LOSS

Profit is the excess of selling price over cost. Conversely, loss is the excess of cost over selling price. Profit or loss may be expressed as a percentage of either the cost or the selling price.

Profit Based on Cost

EXAMPLE—Goods costing \$75 are sold at a profit of 20% of the cost. Find the selling price.

Cost is the base or 100%
 Profit = 20% of cost.
 Selling price = 120% of cost.

Therefore the selling price = $\frac{120}{100}$ of \$75, or \$90.

1. Prepare solutions for the following problems.

(1) Cost price, \$24.50; profit, 20% of cost.
 Find the selling price.

(2) Cost price, \$84.00; loss, 10%. Find the selling price.

(3) Cost price, \$2.36; profit, 25%. Find the selling price.

(4) Cost price, \$8.40; loss, 15%. Find the selling price.

2. Calculate the selling price of each of the following.

No.	COST	PER CENT GAIN OR LOSS ON COST	SELLING PRICE	No.	COST	PER CENT GAIN OR LOSS ON COST	SELLING PRICE
1	\$ 108.00	12½% gain		6	\$.50	20% loss	
2	98.50	20% gain		7	1,800.00	33⅓% gain	
3	10.20	10% loss		8	750.00	5% loss	
4	8.50	150% gain		9	87.50	16% gain	
5	75.00	75% gain		10	48.00	8% loss	

PROFIT AND LOSS

Profit Based on the Selling Price

EXAMPLE—By selling goods for \$80, 20% profit was realized on the selling price. Calculate the cost of the goods sold.

Selling price is the base or 100%

Profit = 20% of the selling price.

Cost of the goods sold = 80% of the selling price.

Therefore, the cost of goods sold = $\frac{80}{100}$ of \$80 or \$64.

1. Prepare solutions for the following problems.

(1) A profit of 30% of the selling price was made on sales of \$840.00. Calculate the cost of goods sold.

(2) On sales of \$1,200, the profit was 25% of the selling price. Calculate the cost of goods sold.

(3) On sales of \$125.00, a merchant took a loss of 10% of his sales. Calculate the cost of the goods sold.

(4) On sales of \$1,500, the profit was 40% of the sales. Calculate the cost of the goods sold.

2. In each of the following cases, calculate the cost of the goods sold.

No.	SELLING PRICE	PER CENT GAIN OR LOSS ON S.P.	COST OF GOODS SOLD		No.	SELLING PRICE	PER CENT GAIN OR LOSS ON S.P.	COST OF GOODS SOLD	
1	\$ 5.60	10% loss			6	\$ 83.00	15% loss		
2	128.00	28% gain			7	950.00	10% gain		
3	95.00	5% loss			8	725.00	32% gain		
4	285.00	25% gain			9	145.00	7% loss		
5	175.00	30% gain			10	360.00	3% loss		

PROFIT AND LOSS

Calculating the Rate of Profit or Loss

EXAMPLE 1—Goods that cost \$40 were sold for \$50. Calculate the rate of profit *based on cost*.

$$\begin{array}{rcl} \text{Selling price} & = & \$50 \\ \text{Cost price} & = & \underline{40} \\ \text{Profit} & = & \underline{\$10} \end{array}$$

The profit (\$10) as per cent of the cost (\$40) = $\frac{10}{40}$ of 100 or 25%.

EXAMPLE 2—Goods that cost \$40 were sold for \$50. Find the rate of profit *based on the selling price*.

$$\begin{array}{rcl} \text{Selling price} & = & \$50 \\ \text{Cost price} & = & \underline{40} \\ \text{Profit} & = & \underline{\$10} \end{array}$$

The profit (\$10) as a per cent of the selling price (\$50) = $\frac{10}{50}$ of 100 = 20%.

1. Prepare solutions for the following problems.

(1) A merchant's sales for one month were \$18,000. The cost of the goods sold was \$15,000. What was the profit in per cent based on sales?

(2) In order to dispose of certain goods which cost \$75, the sale price had to be cut to \$60. What was the loss in per cent based on cost?

2. Calculate the profit or loss and the profit or loss in per cent as indicated below.

No.	COST PRICE	SELLING PRICE	PROFIT		LOSS		PER CENT PROFIT OR LOSS
1	\$ 32.00	\$ 35.20					on cost price
2	270.30	318.00					on selling price
3	10.50	9.45					on cost price
4	63.75	85.00					on selling price
5	22.00	18.26					on cost price
6	950.00	1,250.00					on selling price

PROFIT AND LOSS

Calculating the Cost and Selling Price When Both the Amount and the Per Cent of Profit or Loss Are Known.

EXAMPLE 1—A merchant's profit was \$150 on goods which were sold at a profit of 25% of the cost. What was the cost and the selling price?

$$25\% \text{ of cost} = \$150.$$

$$100\% \text{ of cost} = \frac{100}{25} \times \$150 = \$600.$$

$$\text{Selling price} = \$600 + \$150 = \$750.$$

EXAMPLE 2—A merchant's profit for one month was \$150. This was at the rate of 25% of his sales. Find the sales and the cost of goods sold.

$$25\% \text{ of sales} = \$150.$$

$$100\% \text{ of sales} = \frac{100}{25} \times \$150 = \$600.$$

$$\text{Cost of goods sold} = \$600 - \$150 = \$450.$$

1. Prepare solutions for the following problems.

(1) What sales figure would show a profit of \$3,000 if goods are sold at a profit of 40% of cost?

(2) A merchant made a profit of \$12,500 in one year, realizing a rate of 25% on his sales. What was the cost of the goods sold?

2. Calculate the cost price and the selling price according to the information supplied in this table.

No.	PROFIT	LOSS	RATE OF PROFIT OR LOSS	COST PRICE		SELLING PRICE	
1	\$ 12.50		25% of cost				
2		\$ 8.10	9% of the selling price				
3		2.25	10% of the cost				
4	58.00		29% of the selling price				
5	225.00		36% of the cost				
6	192.00		16% of the selling price				

PROBLEMS IN PROFIT AND LOSS

Prepare solutions for the following problems.

1. An article which cost \$1.80 was sold at a profit of $8\frac{1}{3}\%$ of the cost price. Calculate the selling price.

2. At what price must I sell goods which cost me \$9.24 so that I may gain $14\frac{2}{7}\%$ of the cost price?

3. Goods which cost \$3.25 were sold at a loss of 20% of the cost price. Calculate the selling price.

4. By selling goods for \$7.36, a loss of $12\frac{1}{2}\%$ was taken on the selling price. What did the goods cost?

5. By selling goods for \$11.60, the seller made a profit of 29% of his selling price. What was the cost of the goods sold?

PROBLEMS IN PROFIT AND LOSS

6. Goods invoiced at \$120 were sold at a profit of 30% of the invoice price. What was the selling price?

7. At a sale, a price ticket of \$59.40 was put on an article which cost \$76.90. What was the loss in per cent on cost?

8. A profit of \$31.50 was made by marking up goods $33\frac{1}{3}\%$ above cost. What was the selling price?

9. What per cent of profit on sales is made if goods which cost \$875 are sold for \$1,250?

10. Goods which cost \$150 are sold for \$299.95. What is the profit in per cent on cost?

PROBLEMS IN PROFIT AND LOSS

11. By marking up goods 25% above cost, a profit of \$4.80 is realized. Calculate the cost and selling price.

12. Goods costing \$225 were marked up 40% above cost. The goods were later sold to a customer at a discount of 10% of the marked price. What did the customer pay for the goods?

13. If goods cost me \$86.40, and I sell them for \$103.68, what per cent of profit do I make on my cost?

14. Goods that cost \$56.80 had to be sold at a loss of \$6.80. What was the loss in per cent on cost?

15. A merchant's sales for one year were \$51,250. If the cost of the goods sold was \$40,000, what was the profit in per cent on sales?

PROBLEMS IN PROFIT AND LOSS

16. A business house selling rebuilt typewriters offers them to the trade at \$80, less 20% and 10%. If the retailer sells these machines at 40% above his net cost, what price does the consumer pay?

17. A wholesaler bought goods from a manufacturer for \$240, less 25% and 20%. The goods were sold to a retailer at \$256, less 20% and 10%. What per cent on cost was the wholesaler's profit?

18. Goods purchased for \$72.60 less $33\frac{1}{3}\%$ were sold at a profit of \$12.10. What was the profit in per cent on the sales price?

19. The list price of certain goods to a retailer was \$380, less 20% and 5%. The freight charges on the shipment were \$10.90. At what price must the retailer sell the goods to make a profit of $37\frac{1}{2}\%$ on the cost of the goods, including the freight charges?

COMMISSION

Commission is the term usually employed when referring to the remuneration paid to agents for their services. As a rule, commission is calculated as a percentage; for example, a per cent of sales made by a salesman. In some cases, a salesman's remuneration is a combination of salary and commission.

EXAMPLE—A salesman received a commission of 3% on all sales over \$50 a day. What is his commission on a day's sales of \$120?

Amount on which commission is paid = $\$120 - \$50 = \$70$.

3% of \$70 = \$2.10.

Prepare solutions for the following problems.

1. A salesgirl for a department store receives $2\frac{1}{2}\%$ commission on all sales above \$50 a day. What is her commission for the following week's sales?

Monday.....	\$126.50	Thursday....	\$225.75
Tuesday.....	87.25	Friday.....	175.80
Wednesday....	45.00	Saturday....	387.90

2. A door-to-door salesman selling floor wax made the following sales:

Monday.....	52 cans	Thursday....	102 cans
Tuesday.....	56 "	Friday.....	75 "
Wednesday....	47 "	Saturday....	30 "

The wax was sold at 75 cents a can; the salesman's commission was 20%. How much commission did the salesman make?

3. On a commission basis of 10%, what must be the total annual sales volume of an agent who wishes to earn an average income of \$75 a week?

COMMISSION

A commission agent or broker is one whose business is the buying or selling of goods for another person or business house called the principal. When the transaction is one of selling goods, the agent sends to the principal an itemized statement of the transaction known as an *Account Sales*.

EXAMPLE—The form of *Account Sales* shown on this page is typical. The charges have been borne by the agent out of his own pocket and, therefore, are deducted from the sales, the net proceeds being the balance which goes to the principal.

<p>Peters & Peters Commission Merchants Windsor, Ontario</p>			
Sold for the account of:		Date: October 20, 19__	
Fine Fruits Company, Leamington, Ont.			
300 baskets Peaches	@ \$1.50		\$ 450.00
200 baskets Apples	@ \$2.00		400.00
			<u>850.00</u>
	Charges		
Trucking		\$ 25.00	
Insurance		10.00	
Commission, 5% of \$850.00		42.50	77.50
Net Proceeds			<u><u>772.50</u></u>

Make the necessary extensions and find the net proceeds for the *Account Sales* illustrated below. All headings have been omitted.

1500 doz. Eggs	@ \$.58				
3000 lb. Cheese	@ .70				
1200 lb. Butter	@ .65				
	Charges				
Trucking		50	00		
Insurance		15	00		
Commission @ 6%					
Net Proceeds					

COMMISSION

1. Complete the extensions in the following Account Sales and calculate the net proceeds.

(1)					
175 cases	Oranges	@ \$5.50			
150 bushels	Apples	@ 3.25			
90 boxes	Grapefruit	@ 2.50			
		Charges			
	Freight		34 80		
	Cartage		10 00		
	Commission @ 8%				
	Net Proceeds				
(2)					
4500 bushels	Potatoes	@ \$.75			
2575 "	"	@ .82			
5200 "	"	@ .85			
		Charges			
	Freight and cartage		100 00		
	Other charges		25 00		
	Commission @ 5%				
	Net Proceeds				

2. Fill in the blank columns in this following table.

No.	SALES	FREIGHT	OTHER CHARGES	RATE OF COMMISSION	COM-MISSION	TOTAL CHARGES	NET PROCEEDS
1	\$2,100.00	\$18.75	\$32.50	5%			
2	1,500.00	16.20	18.75	4½%			
3	5,600.00	82.50	26.00	5½%			
4	1,875.00	28.75	14.25	6%			
5	4,500.00	56.00	21.60	8%			
6	5,960.00	93.00	13.75	7%			

SIMPLE INTEREST

Interest is a charge for the use of a sum of money called the *principal*. The rate of interest is expressed as a per cent of the principal, and unless expressed otherwise is understood to be an annual rate.

EXAMPLE 1—Calculate the interest on \$300 at 5% for 2 years.

The interest on \$100 for 1 year at 5% = \$5.00.

" " " \$100 " 2 years at 5% = $2 \times \$5 = \10.00 .

" " " \$300 " 2 years at 5% = $3 \times \$10 = \30.00 .

The solution resolves itself into the following formula:

Interest = Principal \times Rate \times Time in years.

= \$300 \times 5% \times 2.

= \$300 \times .05 \times 2 = \$30.

Observe that 5% must be expressed either as .05 or $\frac{5}{100}$. Use whichever appears to be the easier in any particular case.

If the time is given in months or days, it must be expressed in the formula in years.

EXAMPLE 2—Calculate the interest on \$300 for 3 months at 5%.

Interest = Principal \times Rate \times Time in years.

= \$300 \times .05 \times $\frac{3}{12}$ = \$3.75.

EXAMPLE 3—Calculate the interest on \$300 for 30 days at 5%.

Interest = Principal \times Rate \times Time in years.

= \$300 \times .05 \times $\frac{30}{365}$ = \$1.23.

Using the above formula, calculate the interest for each of the following. Show the formula and the figures substituted in the formula.

1. \$500 at 3% for 15 years.

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2. \$7,850 at $3\frac{1}{2}\%$ for 12 years.

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3. \$1,632 at $1\frac{1}{2}\%$ for $4\frac{1}{2}$ years.

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4. \$765.50 at 6% for 2 years, 3 months.

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SIMPLE INTEREST

5. \$1,875.75 at 4.5% for 1 yr., 10 months.

6. \$640 at 5% for 8 months.

7. \$125.50 at $4\frac{1}{2}\%$ for 6 months.

8. \$85 at 6% for 2 months.

9. \$495.75 at $5\frac{1}{2}\%$ for 4 months.

10. \$1,825.25 at $2\frac{1}{2}\%$ for 9 months.

11. \$1,500 at $2\frac{3}{4}\%$ for 73 days.

12. \$1,425 at 5% for 292 days.

13. \$765.85 at 6% for 219 days.

14. \$48.75 at $3\frac{1}{2}\%$ for 146 days.

15. \$156.00 at 4% for 33 days.

16. \$755.60 at 6% for 108 days.

SIMPLE INTEREST

When the time is expressed as being from one specific date to another, count the day on which the interest should be paid but NOT the day beginning the period.

EXAMPLE—Calculate the interest on \$300 at 5% from January 2, 1954 to March 16, 1954.

Number of days: January	— 29	Interest = Principal × Rate × Time.
February	— 28	
March	— $\frac{16}{73}$	$= \$300 \times .05 \times \frac{73}{365} = \$3.00.$

Calculate the interest in each of the following exercises. Show your solutions, including the calculation of the number of days.

1. \$380 at 6% from May 10, 1955 to October 15, 1955.

2. \$1,564.80 at 5% from November 18, 1954 to February 16, 1955.

3. \$766.40 at 6% from January 14, 1955 to March 14, 1955.

4. \$7,652.25 at $5\frac{1}{2}\%$ from July 1, 1955 to August 10, 1955.

BORROWING FROM A BANK

When a bank loan is for an indefinite period, the banker requests the borrower to sign a promissory note payable *on demand*. The interest on the note is calculated at the end of each month and charged to the borrower's bank account. Any payment on the note will be endorsed on the back of the note until it is paid in full.

EXAMPLE—S. Student borrowed from the bank and gave the following note. What amount of interest will be charged to his account on September 30, 19..?

\$250.00	Windsor, Ont., Sept. 1, 19__
On demand I promise to pay to the order of	
The Collegiate Bank	
Two hundred and fifty.....00/100 DOLLARS	
with interest at 6% per annum until paid.	
Value received.	
S. Student	

Oct. 1/, 19__
Paid \$50.00

Interest on \$250.00 at 6% from Sept. 1, 19.. to Sept. 30, 19..

$$= \$250.00 \times .06 \times \frac{29}{365} = \$1.19.$$

Solve the following problems, showing your solutions in the spaces provided.

1. Calculate the interest on the note shown above on the following dates and according to the following payments. Observe that one payment of \$50.00 has been recorded on October 1.

- (1) November 1, 19--, payment on this date, \$50.00.
- (2) December 1, 19--, payment on this date, \$75.00.
- (3) January 3, 19--, payment on this date, \$25.00.
- (4) February 1, 19--, payment on this date, \$50.00.

(1)	(2)
(3)	(4)

2. On Sept. 15, 19.., A borrowed \$300.00 from his bank at $5\frac{1}{2}\%$ on a demand note, the bank charging interest to A's account at the end of each month. A made no payments on the note until December 15, 19.., at which time he paid the note in full. What were the monthly charges for interest on the note up to the time of payment?

BORROWING FROM A BANK

When the loan is for a definite period, the bank will require a promissory note payable on a specific date. In this case, the bank deducts the interest in advance and deposits the remainder, called the *proceeds*, to the borrower's bank account. This procedure is known as *discounting* the note.

EXAMPLE—S. Student borrowed from the bank and gave the following note. Calculate the amount of the proceeds to be deposited to his account if the bank discounts the note at 6%.

\$250.00	Windsor, Ont., Aug. 31/, 19__
Two months after date I promise to pay to the order of	
The Collegiate Bank	
Two hundred and fifty..... 00/100 DOLLARS	
Value received.	S. Student

To calculate the discount (interest) on this type of note, three days called *days of grace* must be added to the time specified on the note. The above note, therefore, becomes legally due three days after the end of the two months, or November 3, 19...

The discount (interest) on \$250.00 at 6% from Aug. 31, 19__ to Nov. 3, 19__.

$$= \$250.00 \times .06 \times \frac{64}{365} = \$2.63.$$

The proceeds to be deposited = \$250.00 - \$2.63 = \$247.37.

1. Calculate the proceeds from the following notes discounted on the same day as the loan was made. Show solutions in the spaces provided below.

	FACE VALUE OF NOTE	DATE OF THE LOAN	LENGTH OF TIME OF LOAN	DISCOUNT RATE
(1)	\$350.00	June 1, 19__	30 days	6%
(2)	\$400.00	July 15, 19__	90 days	5½%
(3)	\$500.00	Aug. 2, 19__	2 months	6%
(4)	\$250.00	Sept. 6, 19__	3 months	5½%

(1)	(2)
(3)	(4)

BANK EXCHANGE ON OUT-OF-TOWN CHEQUES

A bank does not charge a fee for cashing a cheque drawn on another bank in the same locality. However, when a bank pays a cheque drawn on an out-of-town bank, it charges a fee, called *exchange*. This fee is to cover the expense involved in having a cheque cleared through the clearing house and returned to the bank on which it is drawn.

In calculating exchange, banks have a scale of rates of reducing percentage depending on the amount of the cheque paid. The most frequently used rates are:

(1) On cheques drawn on a branch of the *same* bank as that which pays the cheque, $\frac{1}{8}\%$, with a minimum of 15 cents.

(2) On cheques drawn on a branch of a *different* bank from that which pays the cheque, $\frac{1}{4}\%$ with a minimum of 25 cents.

When depositing or cashing cheques on which exchange is charged, it is usual to *deduct* the exchange from the face value of the cheque and deposit or accept the net proceeds. Using this procedure, calculate the net proceeds of each cheque in the following exercises and the total deposit. Prove each deposit by totals. A minimum charge of 15 cents applies on cheques subject to an exchange charge of $\frac{1}{8}\%$; and 25 cents, on cheques subject to a $\frac{1}{4}\%$ charge.

DEPOSIT 1

DEPOSIT 2

No.	FACE OF CHEQUE	EXCH. RATE	EXCHANGE	NET PROCEEDS	No.	FACE OF CHEQUE	EXCH. RATE	EXCHANGE	NET PROCEEDS
1	\$150.00	$\frac{1}{8}\%$			1	\$190.00	$\frac{1}{4}\%$		
2	145.00	$\frac{1}{4}\%$			2	260.00	$\frac{1}{8}\%$		
3	65.50	$\frac{1}{4}\%$			3	15.80	$\frac{1}{8}\%$		
4	112.65	$\frac{1}{8}\%$			4	98.25	$\frac{1}{4}\%$		
5	275.80	$\frac{1}{8}\%$			5	245.50	$\frac{1}{8}\%$		
Tot.					Tot.				

DEPOSIT 3

DEPOSIT 4

No.	FACE OF CHEQUE	EXCH. RATE	EXCHANGE	NET PROCEEDS	No.	FACE OF CHEQUE	EXCH. RATE	EXCHANGE	NET PROCEEDS
1	\$ 13.78	$\frac{1}{8}\%$			1	\$326.50	$\frac{1}{4}\%$		
2	321.00	$\frac{1}{4}\%$			2	42.96	$\frac{1}{8}\%$		
3	125.00	$\frac{1}{8}\%$			3	298.50	$\frac{1}{4}\%$		
4	120.00	$\frac{1}{4}\%$			4	120.00	$\frac{1}{8}\%$		
5	100.00	$\frac{1}{4}\%$			5	110.00	$\frac{1}{4}\%$		
Tot.					Tot.				

THE BANK RECONCILIATION STATEMENT

At the end of any month, the balance which appears on the stub of your cheque book may not be the balance that appears on the bank's monthly statement of your bank account. Certain cheques which have been issued may not yet have been returned to the bank and so do not appear on the bank statement. Also, the bank may have charged for services and interest on loans, and these charges do not appear on the cheque book stubs.

EXAMPLE—At the end of the month, A's cheque book shows a balance of \$421.30. The statement from the bank shows a balance of \$475.35. Comparison of the cheque book with the bank statement shows that cheques for \$28.50 and \$29.15 are outstanding (have not been returned to the bank) and the bank has charged \$2.60 for interest on a loan and \$1.00 for service charges. Reconcile the two balances.

Bank Reconciliation Statement			
Balance according to the bank statement			\$475.35
Less outstanding cheques:	\$28.50		
	29.15		57.65
True bank balance			\$417.70
Balance according to cheque book			\$421.30
Less: Interest charged on loan	\$ 2.60		
Service charges	1.00		3.60
True cheque book balance			\$417.70

Prepare Bank Reconciliation Statements for the following.

1. Balance according to the bank statement, \$312.15; balance according to the cheque book, \$276.05; outstanding cheques, \$21.00 and \$19.25; interest charged by the bank, \$3.40; bank service charges, \$.75.

2. Balance according to the cheque book, \$227.11; balance according to the bank statement, \$247.50; outstanding cheques, \$4.80 and \$15.00; bank charges against cheques drawn, 60 cents; interest earned on deposits credited by bank, \$1.19.

GENERAL PRACTICE IN FUNDAMENTAL OPERATIONS

1. Add the following, checking all addition for accuracy.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
\$23.75	\$54.35	\$35.65	\$24.95	\$43.25	\$75.55	\$85.35	\$74.75
16.18	32.56	35.98	46.83	24.48	98.57	12.86	41.75
38.96	47.35	37.96	29.48	37.56	97.86	24.35	35.46
19.98	18.87	17.76	16.65	15.54	14.43	13.32	12.21
33.45	44.56	55.67	66.78	77.88	88.99	99.11	22.33
12.34	23.34	34.56	56.78	67.89	12.54	14.35	54.35
64.97	35.56	57.38	92.15	75.38	94.39	27.35	35.64
64.55	33.57	56.75	84.45	76.35	94.25	24.25	84.95
72.25	93.75	64.25	83.85	55.95	24.75	35.45	95.74
36.47	27.74	38.84	94.38	21.75	95.73	16.74	93.28

2. Calculate the values in per cent as indicated below.

(1) 2% of \$ 253.00	\$		(10) 2½% of \$ 725.00	\$	
(2) 3% of 1,568.00			(11) 3½% of 1,236.00		
(3) 4% of 3,745.00			(12) 4½% of 3,823.00		
(4) 5% of 985.00			(13) 5½% of 2,325.00		
(5) 6% of 2,375.00			(14) 6½% of 938.00		
(6) 7% of 5,326.00			(15) 7½% of 4,375.00		
(7) 8% of 2,975.00			(16) 8½% of 425.00		
(8) 9% of 356.00			(17) 9½% of 5,326.00		
(9) 10% of 3,275.00			(18) 10½% of 6,325.00		

3. Calculate $\frac{1}{8}\%$ of each amount in the following table.

4. Calculate $\frac{1}{4}\%$ of each amount in the following table.

5. Calculate $\frac{1}{2}\%$ of each amount in the following table.

No.	AMOUNT	$\frac{1}{8}\%$	No.	AMOUNT	$\frac{1}{4}\%$	No.	AMOUNT	$\frac{1}{2}\%$
(1)	\$2,475.00		(1)	\$3,756.00		(1)	\$7,325.00	
(2)	1,645.00		(2)	1,462.00		(2)	548.00	
(3)	575.50		(3)	875.50		(3)	1,525.00	
(4)	1,435.60		(4)	2,861.00		(4)	942.35	
(5)	476.95		(5)	237.25		(5)	1,912.25	
(6)	3,648.75		(6)	4,364.35		(6)	2,321.15	
(7)	125.50		(7)	225.45		(7)	112.25	

UNIT 7

INSURANCE ON LIFE AND PROPERTY

CALCULATING THE PREMIUMS

An insurance *policy* is a contract between the party insured and the insurance company. The cost of the *policy* to the insured person is called the *premium*.

The essence of insurance is protection in case of loss. Almost any type of risk can be covered by insurance. In this unit, however, we shall be concerned only with the premium cost of life insurance and property insurance.

Premiums on life insurance are quoted at an annual rate for each \$1,000 of insurance. At the option of the insured, the premiums may be payable weekly, monthly, semi-annually or annually, but when payable other than annually, the premium rate is slightly higher than the annual rate.

Premiums on property insurance are quoted either as a per cent of the policy or at "so much" per \$100, and are usually payable every three years. When insurance is obtained for a shorter period, the rate is slightly higher proportionately than the three-year rate.

EXAMPLE 1—Find the annual premium on a \$5,500 life insurance policy at \$22.30 per \$1,000.

On \$1,000, the premium is \$22.30.

On \$5,500, the premium is $\frac{5,500}{1,000} \times \22.30 , or \$122.65.

EXAMPLE 2—Find the premium on a fire insurance policy for \$8,000 at 80 cents per \$100, every three years.

On \$100, the premium is \$.80.

On \$8,000, the premium is $\frac{8,000}{100} \times \$.80$, or \$64.00.

1. Calculate the premiums on the following life insurance policies.

No.	POLICY	RATE PER \$1,000	PREMIUM		No.	POLICY	RATE PER \$1,000	PREMIUM	
1	\$ 2,500.00	\$21.55			5	\$ 5,000.00	\$48.30		
2	4,500.00	30.40			6	6,000.00	32.15		
3	10,000.00	25.05			7	1,500.00	23.40		
4	16,500.00	22.85			8	23,500.00	21.35		

2. Calculate the premiums on the following property insurance policies.

No.	POLICY	RATE	PREMIUM		No.	POLICY	RATE	PREMIUM	
1	\$ 8,400.00	$\frac{7}{8}\%$			4	\$15,800.00	$\frac{3}{4}\%$		
2	9,600.00	60c per \$100			5	3,600.00	$1\frac{1}{4}\%$		
3	12,000.00	79c per \$100			6	25,000.00	67c per \$100		

PROBLEMS IN INSURANCE

Prepare solutions for the following problems.

1. The annual premium on a 20-year life insurance policy for \$8,000 is at the rate of \$31.20 for each \$1,000. How much will have been paid in premiums over the 20 years?

2. The annual rate on a whole-life policy for a man 26 years of age is \$21.55 for each \$1,000. How much will he have paid in premiums on a whole-life policy for \$10,000 by the time he reaches age 65?

3. How much is the average yearly cost of a fire insurance policy of \$7,500 at $\frac{3}{4}\%$ for a three-year policy? Over a period of 15 years, how much will the premiums on this policy have cost?

4. A house valued at \$12,000 is insured for four-fifths of its value at $\frac{7}{8}\%$ for a three-year term. Find the average premium cost a year.

5. A man paid premiums for 20 years on an endowment policy at the rate of \$48.30 a year. At the end of that time, he received the value of the policy, \$5,000. Compare the total premiums paid with the value of the policy received. (The rate quoted above is for each \$1,000.)

GENERAL PRACTICE IN FUNDAMENTAL OPERATIONS

1. Add the following, checking all additions for accuracy.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
\$46.23	\$47.38	\$58.39	\$96.45	\$37.75	\$54.68	\$29.14	\$56.23
23.31	34.26	14.36	95.13	59.17	37.58	28.94	42.31
85.55	36.65	38.75	85.95	75.25	64.25	84.25	78.25
75.31	46.13	67.46	26.49	94.34	75.64	27.95	59.14
57.47	95.48	29.48	49.16	14.56	16.47	21.49	19.19
53.94	91.73	38.16	29.57	35.95	35.34	97.78	56.45
86.78	68.79	97.68	46.57	35.46	25.34	12.34	19.81
65.56	67.59	46.54	32.43	98.67	12.32	75.57	36.54
75.75	57.35	54.25	85.65	95.75	85.75	87.35	93.25
47.35	46.45	56.45	78.65	74.25	12.65	19.75	82.25

2. Compute the premiums on the policies listed in the left-hand column according to the rates given in the other columns. Total as required.

No.	POLICY	PREMIUM RATES						TOTALS	
		65c per \$100		$\frac{3}{4}\%$		85c per \$100		$\frac{5}{8}\%$	
1	\$ 4,000								
2	6,000								
3	600								
4	10,000								
5	2,000								
6	2,400								
7	8,650								
8	12,500								
Totals									

3. Compute premiums on the policies in the left-hand column according to the rates given in the other columns. Total as required.

No.	POLICY	PREMIUM RATES PER \$1,000						TOTALS	
		\$19.55		\$28.20		\$23.20		\$47.80	
1	\$ 6,500								
2	10,500								
3	18,750								
4	9,500								
5	23,000								
Totals									

UNIT 8

MUNICIPAL TAXES ON LAND AND BUILDINGS

CALCULATING THE TAX

In order to provide services such as schools, and fire and police protection for its residents, a municipality raises money by levying a tax on the land and buildings within its boundaries. For taxation purposes, a value called an *assessment* is set on each piece of land and each building, and it is on this value — *not* on the actual value of the property — that the rate of tax is based.

The tax rate is usually expressed in *mills*. A mill is $\frac{1}{10}$ of a cent or $\frac{1}{1000}$ of a dollar. Thus, 40 mills equals 4 cents or \$.04, and 45 mills equals $4\frac{1}{2}$ cents or \$.045. To change mills to dollars, therefore, place the decimal point *three* places to the left.

EXAMPLE—A piece of property is assessed for taxation purposes at \$4,500. The tax rate is 50 mills. What is the tax on the property?

The taxpayer pays 50 mills on each dollar of assessment.

50 mills equals 5 cents, or \$.05.

Taxes = Assessment \times Rate.

Therefore, the tax is $\$4,500 \times .05$, or \$225.00.

1. Express the following mills in dollars.

No.	MILLS	DOLLARS	No.	MILLS	DOLLARS	No.	MILLS	DOLLARS
1	25		6	$17\frac{1}{2}$		11	$11\frac{1}{4}$	
2	35		7	$33\frac{1}{2}$		12	$10\frac{3}{4}$	
3	40		8	$8\frac{1}{4}$		13	$32\frac{1}{4}$	
4	55		9	$1\frac{1}{2}$		14	$42\frac{3}{4}$	
5	38		10	$41\frac{1}{4}$		15	$50\frac{1}{2}$	

2. Calculate the taxes in each of the following exercises. Show solutions.

(1) Assessment, \$3,200; rate, 42 mills.

(2) Assessment, \$3,900; rate, 39 mills.

(3) Assessment, \$4,200; rate, 25.5 mills.

(4) Assessment, \$5,200; rate, 57.5 mills.

CALCULATING THE TAX

(5) Assessment, \$2,000; rate, 51 mills.

(6) Assessment, \$2,550; rate, 47 mills.

(7) Assessment, \$4,000; rate, 25.5 mills.

(8) Assessment, \$5,400; rate, 24 mills.

(9) Assessment, \$5,850; rate, 47 mills.

(10) Assessment, \$4,500; rate, $37\frac{1}{2}$ mills.

(11) Assessment, \$6,100; rate, $42\frac{1}{2}$ mills.

(12) Assessment, \$3,800; rate, 55.5 mills.

(13) Assessment, \$10,200; rate, 20.5 mills.

(14) Assessment, \$9,650; rate, 23 mills.

(15) Assessment, \$7,425; rate, 38.5 mills.

(16) Assessment, \$3,265; rate, 49.8 mills.

PROBLEMS IN MUNICIPAL TAXES ON LAND AND BUILDINGS

Prepare solutions for the following problems.

1. A house cost \$12,500 to build. It is assessed at 60% of its cost. If the tax rate is 53 mills, how much is the tax on this property?

2. The total property assessment of a certain city is approximately \$150,000,000. If the tax rate is set at 57 mills, how much money will be raised from this source, provided all taxes are collected?

3. A city with a total assessment of \$155,000,000 finds that a levy of 16 mills is required to maintain the schools. At this rate, how much money is needed from the property owners of the municipality for educational purposes?

4. The tax rate in my city is apportioned as follows: secondary schools, 5 mills; elementary schools, 9 mills; police and fire protection, 10 mills; and all other purposes, 21 mills. If my house is assessed at \$4,200, find how much I must pay for each of these services and my total tax.

GENERAL PRACTICE IN FUNDAMENTAL OPERATIONS

1. Add the following, checking all addition carefully.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
\$42.47	\$59.25	\$93.46	\$13.97	\$64.86	\$75.34	\$75.25	\$76.95
64.97	86.56	94.73	75.96	94.36	73.25	39.45	86.46
12.35	65.46	86.68	57.48	49.37	37.95	95.59	57.23
12.34	13.45	14.56	15.67	16.78	18.79	18.89	23.45
56.37	28.95	95.57	64.37	28.45	35.45	37.74	96.53
19.86	91.76	41.35	15.64	31.68	51.96	27.58	49.15
73.73	75.59	29.85	85.35	28.25	25.75	45.65	15.75
75.99	46.55	29.89	91.69	25.68	29.67	15.84	28.96
71.48	17.85	38.25	38.59	64.96	94.32	85.85	73.42
14.55	61.45	81.31	21.96	46.11	16.83	24.82	38.15
(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
\$72.91	\$56.31	\$58.95	\$28.28	\$34.24	\$16.55	\$99.44	\$17.45
15.65	43.98	34.65	98.65	75.35	75.36	86.52	64.24
15.46	26.48	71.85	18.75	19.75	26.14	35.25	85.45
95.37	25.65	56.75	65.86	27.16	24.19	12.84	19.86
91.75	61.51	21.46	45.13	27.96	47.35	25.43	85.85
11.98	34.24	45.34	67.58	63.12	95.17	17.85	31.13
85.34	45.45	55.55	56.86	41.86	29.95	49.84	13.51
68.64	32.64	85.35	96.64	46.64	35.25	85.35	24.51
23.56	56.43	76.45	78.23	16.47	36.98	15.35	82.19
16.85	36.57	27.64	96.85	47.85	41.85	75.37	35.85

2. Calculate the taxes according to the assessments and rates given in this table.

No.	ASSESSMENT	MILL RATE	TAXES		No.	ASSESSMENT	MILL RATE	TAXES	
1	\$ 1,550	40			11	\$ 2,262	43		
2	6,814	39.5			12	6,995	41		
3	1,950	53			13	1,381	80		
4	4,817	32			14	2,925	37		
5	3,576	36			15	2,990	49.5		
6	3,504	42			16	4,866	42		
7	5,885	31.7			17	2,615	37		
8	6,650	34.5			18	2,250	38		
9	4,780	36			19	6,500	31.8		
10	4,600	35.5			20	7,450	36.75		

UNIT 9

WEIGHTS AND MEASURES

CONVERSION AND ADDITION OF UNITS OF MEASURE

Conversion of One Unit to a Lower Unit

EXAMPLE—Express 3 yd., 2 ft. in inches.

$$3 \text{ yd.} = 3 \times 3 = 9 \text{ ft.}; 9 \text{ ft.} + 2 \text{ ft.} = 11 \text{ ft.} = 11 \times 12 = 132 \text{ inches.}$$

1. Express the following measurements in lower units as indicated. Use a scratch pad for your calculations. (The Tables of Weights and Measures are on the inside back cover.)

(1) 1 mile =	in.	(6) 4 sq. mi. =	acres
(2) 45 rd., 1 yd. =	ft.	(7) 10 lb., 10 oz. (avoir) =	gr.
(3) 10 cu. yd., 10 cu. ft. =	cu. ft.	(8) 10 lb., 10 oz. (troy) =	gr.
(4) 3 tons, 15 cwt. =	lb.	(9) 6 gal. (Can.) =	cu. in.
(5) 5 gal., 3 qt. =	pt.	(10) 6 gal. (U.S.) =	cu. in.

Conversion of One Unit to a Higher Unit

EXAMPLE—Express 132 inches in the highest possible units.

(1) Divide 132 inches by 12 to bring to feet; result = 11 ft.

(2) Divide 11 ft. by 3 to bring to yards; result = 3 yd., 2 ft.

2. Express the following measurements in the highest units possible.

(1) 15750 lb. =	(6) 60 oz. (Troy) =
(2) 900 oz. (Avoir) =	(7) 85 cu. ft. =
(3) 1000 rods =	(8) 100 pt. =
(4) 986 sq. in. =	(9) 1280 sq. yd. =
(5) 5000 sq. yd. =	(10) 2000 acres =

Addition of Mixed Units of the Same Measure

EXAMPLE—Add: 3 yd., 2 ft., 9 in.

1 yd., 2 ft., 10 in.

4 yd., 4 ft., 19 in.

Expressed in the highest possible units:

4 ft., 19 in. = 5 ft., 7 in.

5 ft., 7 in. = 1 yd., 2 ft., 7 in.

Therefore, the total is 5 yd., 2 ft., 7 in.

3. Add the following measurements, and express in the highest possible units.

(1) 2 yd., 2 ft., 10 in. 1 yd., 1 ft., 6 in. 1 yd., 2 ft., 3 in.	(2) 3 bu., 2 pk., 1 gal. 4 bu., 3 pk., 1 gal. 8 bu., 1 pk., 1 gal.	(3) 5 cu. yd., 10 cu. ft. 8 cu. yd., 15 cu. ft. 19 cu. yd., 9 cu. ft.

SUBTRACTION, MULTIPLICATION, AND DIVISION OF UNITS OF MEASURE

Subtraction of Mixed Units of the Same Measure

EXAMPLE— $3 \text{ yd., } 1 \text{ ft., } 11 \text{ in.} = 2 \text{ yd., } 4 \text{ ft., } 11 \text{ in.}$
 $\underline{1 \text{ yd., } 2 \text{ ft., } 10 \text{ in.}} = \underline{1 \text{ yd., } 2 \text{ ft., } 10 \text{ in.}}$
 $\quad \quad \quad 1 \text{ yd., } 2 \text{ ft., } 1 \text{ in.}$

In order to subtract, 1 yd. (3 ft.) was borrowed from the 3 yd. and added to the 1 ft., making 4 ft. When it is necessary therefore, we may borrow from the next higher unit to complete the subtraction.

1. Complete the following subtractions.

(1) $\begin{array}{r} 9 \text{ yd., } 2 \text{ ft., } 6 \text{ in.} \\ 3 \text{ yd., } 1 \text{ ft., } 9 \text{ in.} \\ \hline \\ \hline \end{array}$

(2) $\begin{array}{r} 10 \text{ sq. yd., } 6 \text{ sq. ft.} \\ 7 \text{ sq. yd., } 8 \text{ sq. ft.} \\ \hline \\ \hline \end{array}$

(3) $\begin{array}{r} 8 \text{ gal., } 3 \text{ qt., } 0 \text{ pt.} \\ 5 \text{ gal., } 3 \text{ qt., } 1 \text{ pt.} \\ \hline \\ \hline \end{array}$

Multiplication of Mixed Units of the Same Measure

EXAMPLE— $\begin{array}{r} 3 \text{ ft., } 6 \text{ in.} \\ \times 5 \\ \hline 15 \text{ ft., } 30 \text{ in.} \end{array}$ But $15 \text{ ft., } 30 \text{ in.} = 17 \text{ ft., } 6 \text{ in.}$
 $\quad \quad \quad = 5 \text{ yd., } 2 \text{ ft., } 6 \text{ in.}$

2. Complete the following multiplications.

(1) $\begin{array}{r} 3 \text{ cwt., } 20 \text{ lb., } 6 \text{ oz.} \\ \times 12 \\ \hline \\ \hline \\ \hline \end{array}$

(2) $\begin{array}{r} 1 \text{ yd., } 2 \text{ ft., } 6 \text{ in.} \\ \times 9 \\ \hline \\ \hline \\ \hline \end{array}$

(3) $\begin{array}{r} 35 \text{ bu., } 3 \text{ pk., } 1 \text{ gal.} \\ \times 8 \\ \hline \\ \hline \\ \hline \end{array}$

Division of Mixed Units of the Same Measure

EXAMPLE— $\begin{array}{r} 2 \overline{) 3 \text{ ft., } 6 \text{ in.}} \\ \underline{1 \text{ ft., } 9 \text{ in.}} \end{array}$ Note that the remainder, 1 ft., left after dividing 3 ft. by 2, is carried to the next unit as 12 inches, making the 6 inches 18 inches. $18 \text{ in. divided by } 2 = 9 \text{ in.}$

3. Complete the following divisions.

(1) $6 \overline{) 10 \text{ yd., } 2 \text{ ft.}}$

(2) $9 \overline{) 60 \text{ acres, } 30 \text{ sq. yd.}}$

(3) $12 \overline{) 87 \text{ lb., } 12 \text{ oz.}}$

(4) $8 \overline{) 45 \text{ bu.}}$

(5) $7 \overline{) 22 \text{ sq. yd., } 5 \text{ sq. ft.}}$

(6) $10 \overline{) 57 \text{ cu. yd., } 11 \text{ cu. ft.}}$

DIVISION OF UNITS OF MEASURE

EXAMPLE— How many times is 2 ft., 6 in. contained in 3 yds., 2 ft.?

The quantities must first be expressed in the same unit. Thus, the above example may be solved by either of the following methods.

$$(1) \text{ 3 yds., 2 ft., } = 11 \text{ ft.; } 2 \text{ ft., 6 in. } = 2\frac{1}{2} \text{ ft.; } 11 \text{ ft. } \div 2\frac{1}{2} \text{ ft. } = 4\frac{2}{5} \text{ ft.}$$

$$(2) \text{ 3 yds., 2 ft. } = 132 \text{ in.; } 2 \text{ ft., 6 in. } = 30 \text{ in.; } 132 \text{ in. } \div 30 \text{ in. } = 4\frac{2}{5} \text{ ft.}$$

1. Prepare solutions for the following exercises.

(1) How many times is 8 cu. ft. contained in 2 cu. yd., 10 cu. ft.?

(2) Divide 16 lb., 3 oz. by 2 lb., 5 oz.

(3) How many packages, each containing 1 lb., 9 oz., can be made up from a bulk lot of 100 lb.?

(4) How many pieces 1 ft., 9 in. long can be cut from a length of 10 yds., 3 ft., 3 in.?

2. Divide as indicated. Use a scratch pad for your calculations.

(1) 10 gals. \div 2 qts., 1 pt.	
(2) 50 bu., 3 pk. \div 1 gal., 2 qt.	
(3) 1 mile \div 2 rd., 5 yd.	
(4) 25 sq. yd., 6 sq. ft. \div 1 sq. yd., 2 sq. ft.	
(5) 1 ton \div 2 lb., 8 oz.	
(6) 5 cu. yd. \div .75 cu. ft.	
(7) 1 sq. mi. \div 10 acres	

PROBLEMS IN WEIGHTS AND MEASURES

Prepare solutions for the following problems.

1. What fraction of a gallon is one half-pint?

2. Express 300 lb. as a decimal fraction of a ton.

3. Express 432 cu. in. as a fraction of a cubic yard.

4. Express 50 square rods as a decimal fraction of an acre.

5. Calculate the cost of 30 yd., 1 ft., 4 in. of material at 60 cents a yard.

6. Express 13 cu. ft., 864 cu. in. as a decimal fraction of a cubic yard.

7. In a 10-carat gold ring, what fraction of the metal is gold?

8. Express the weight of a pound of silver as a decimal fraction (to 3 places) of a pound of feathers.

9. What fraction of a bushel is 24 pounds of potatoes?

10. Two quarts of oats are what fraction of a bushel of oats?

11. 6 pounds of water are what fraction of a gallon of water?

12. Express 60 yd., 2 ft., 9 in. in feet.

PROBLEMS IN WEIGHTS AND MEASURES

13. How many cubic inches are contained in one Canadian quart?

14. How many cubic inches are contained in one U.S. quart?

15. Express an American gallon as a decimal fraction of a Canadian gallon.

16. What is the fractional difference between the Canadian gallon and the U.S. gallon? (Give to the closest fraction with a numerator of 1.)

17. If a gasoline tank holds 13 Canadian gallons, how many American gallons will it hold?

18. If a motorist can average 22 miles to a Canadian gallon of gasoline, how many miles would he average on each American gallon?

LUMBER MEASUREMENT

To calculate the number of board feet in a piece of lumber, multiply the length *in feet* by the width *in feet* by the thickness in *inches*.

EXAMPLE—Calculate the number of board feet in a piece of lumber 12 feet long, 4 inches wide, and 2 inches thick. (Written as 1 pc. 2" x 4" — 12')

$$\begin{array}{ccccccc} \text{Length (feet)} & \times & \text{Width (feet)} & \times & \text{Thickness (inches)} & & \\ 12 & \times & 4/12 & \times & 2 & = & 8 \text{ board feet.} \end{array}$$

1. Complete extensions for the following bills for lumber, and total.

20 pieces 1" × 4" — 12', 0"	@ \$120.00 per M		
10 pieces 1" × 6" — 12', 0"	@ 140.00 per M		
12 pieces 1" × 6" — 14', 0"	@ 140.00 per M		
10 pieces 1" × 8" — 12', 0"	@ 140.00 per M		
8 pieces 1" × 4" — 16', 0"	@ 120.00 per M		
14 pieces 1" × 10" — 12', 0"	@ 144.00 per M		
7 pieces 1" × 5" — 14', 0"	@ 98.00 per M		
5 pieces 1" × 6" — 10', 0"	@ 145.00 per M		
11 pieces 1" × 8" — 14', 0"	@ 136.00 per M		
8 pieces 1" × 12" — 12', 0"	@ 155.00 per M		
6 pieces 1" × 12" — 14', 0"	@ 155.00 per M		
Total			

2.

36 pieces 2" × 4" — 16', 0"	@ \$120.00 per M		
72 pieces 2" × 6" — 18', 0"	@ 130.00 per M		
60 pieces 2" × 8" — 12', 0"	@ 135.00 per M		
60 pieces 2" × 10" — 12', 0"	@ 160.00 per M		
28 pieces 2" × 4" — 10', 0"	@ 120.00 per M		
30 pieces 2" × 4" — 14', 0"	@ 120.00 per M		
12 pieces 2" × 12" — 14', 0"	@ 160.00 per M		
200 feet 1" × 2"	@ .08 per lineal foot		
120 feet moulding	@ .05 per lineal foot		
Total			

GENERAL PRACTICE IN FUNDAMENTAL OPERATIONS

1. Add the following. Check all addition for accuracy.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
\$24.86	\$75.65	\$34.97	\$68.56	\$49.75	\$67.55	\$83.85	\$86.78
35.76	97.65	86.58	95.35	26.89	46.76	48.97	96.54
76.87	97.65	45.34	76.34	87.59	58.73	39.82	72.48
49.37	27.49	38.58	39.75	84.93	93.84	75.48	84.36
86.49	28.65	45.67	38.45	27.95	68.46	86.36	87.36
75.75	97.46	24.24	86.46	86.47	86.47	39.47	35.48
65.65	87.46	96.47	96.47	87.35	53.64	75.32	86.53
48.37	96.46	42.43	56.54	64.76	87.65	86.75	96.73
69.79	85.76	47.37	96.35	56.28	49.94	82.72	85.53
<u>34.23</u>	<u>45.36</u>	<u>56.34</u>	<u>67.45</u>	<u>78.34</u>	<u>89.67</u>	<u>92.89</u>	<u>83.49</u>

2. Add and show the sums in the highest possible units.

Cwt.	Lb.	Oz.	Yd.	Ft.	In.	Bu.	Pk.	Gal.	Qt.
5	25	10	5	2	9	6	3	1	1
18	68	8	7	1	10	14	2	0	3
45	16	12	15	2	7	8	1	1	2
19	6	3	7	2	11	13	1	0	3
4	89	13	23	1	9	6	3	1	2
15	36	7	7	2	8	35	2	1	3
9	14	3	16	1	4	3	3	0	2
17	9	8	8	2	11	19	1	1	1
26	4	11	15	1	6	6	2	1	3
<u>5</u>	<u>45</u>	<u>5</u>	<u>9</u>	<u>2</u>	<u>7</u>	<u>9</u>	<u>1</u>	<u>1</u>	<u>2</u>

3. Calculate the net weight and prove by totals.

(1)			(2)		
Gross Lb.	Tare Lb.	Net Lb.	Gross Lb.	Tare Lb.	Net Lb.
13,630	464		27,543	1,554	
24,731	464		35,015	1,554	
18,450	464		14,761	1,554	
<u>36,114</u>	<u>464</u>		<u>8,593</u>	<u>1,554</u>	

4. Calculate the balances and prove by totals.

(1)			(2)		
Debit	Credit	Balance	Debit	Credit	Balance
\$77.24	\$25.66		\$111.35	\$47.55	
44.26	18.88		62.88	51.39	
<u>57.55</u>	<u>32.61</u>		<u>112.42</u>	<u>75.94</u>	

UNIT 10

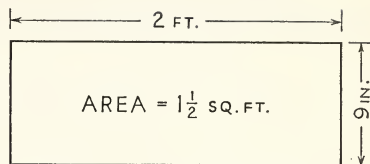
PRACTICAL MEASUREMENTS

RECTANGULAR AREAS

The area of a rectangular surface is found by multiplying the length by the width, both being expressed in the same unit of measure. Thus, the area of the figure to the right is as follows:

$$2 \text{ ft.} \times 9 \text{ in.} = 2 \text{ ft.} \times \frac{3}{4} \text{ ft.} = 1\frac{1}{2} \text{ sq. ft., or}$$

$$24 \text{ in.} \times 9 \text{ in.} = 216 \text{ sq. in.} = 1\frac{1}{2} \text{ sq. ft.}$$



It should be observed that feet multiplied by feet gives square feet. Conversely, square feet divided by feet gives feet. The same principle applies to all units of length and area.

If the area and also the length of a rectangular surface are given, the width may be found by division.

EXAMPLE — A rectangular surface 2', 0" long has an area of $1\frac{1}{2}$ sq. ft. Find the width.
(See the illustration at the top of the page.)

$$1\frac{1}{2} \text{ sq. ft.} \div 2 \text{ ft.} = \frac{3}{2} \div 2 = \frac{3}{2} \times \frac{1}{2} = \frac{3}{4} \text{ ft., or } 9 \text{ in.}$$

Similarly, $1\frac{1}{2} \text{ sq. ft.} \div 9 \text{ in.} = 2', 0''$.

The *perimeter* of a rectangular surface is the distance around it; that is, the sum of the four sides.

1. How many acres are there in each of the following areas? Give your answer correct to 2 decimal places.

No.	LENGTH	WIDTH	AREA IN ACRES	No.	LENGTH	WIDTH	AREA IN ACRES
1	350 ft.	110 ft.		4	400 ft.	300 ft.	
2	100 yd.	100 yd.		5	36 rd.	300 ft.	
3	40 rd.	24 rd.		6	1 mile	$\frac{1}{2}$ mile	

2. The following are dimensions of rectangular figures. Fill in the blanks in the columns below as required.

No.	LENGTH	WIDTH	AREA	PERIMETER
1	6 ft., 2 in.	4 ft., 6 in.	sq. ft.	ft.
2	2 yd., 1 ft.	yd., ft.	3 sq. yd., 1 sq. ft.	yd.
3	200 yd.	yd.	sq. yd.	600 yd.
4	100 rd.	10 rd.	acres	rd.
5	15 yd., 2 ft.	yd., ft.	52 sq. yd., 2 sq. ft.	yd.
6	$1\frac{1}{2}$ miles	440 yd.	acres	miles
7	5 miles	4 miles	acres	miles

PROBLEMS ON RECTANGULAR AREAS

Prepare solutions for the following problems.

1. A plot of ground is 76 feet wide by 148 feet long. Allowing a grass border two feet wide around the inside edge of the plot, how many beds, 4 feet by 8 feet, can be laid out?

A large, empty rectangular box with a light beige background, intended for a drawing or sketch. The box is bounded by a thin black line and occupies the central portion of the page.

2. A room is 20 feet by 12 feet. How many squares of floor tiling, 9 inches by 9 inches, would be required to cover it?

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3. What will it cost to paint the walls and ceiling of a room, 18 feet long, 15 feet wide, and 8 feet high, if a quart of paint costs \$2.00 and covers approximately 150 square feet of surface? Take into consideration the following: Two windows, each 3 feet by 5 feet; and two doors, each 3 feet by 7 feet. Two coats of paint are to be applied.

[illegible]

TRIANGULAR AREAS

The area of a triangle is half the area of a rectangle of which one side is the base of the triangle and the other side is equal to the height of the triangle.

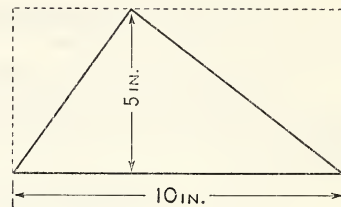
Thus, the area of the triangle in the illustration to the right is $\frac{1}{2}$ (base \times height).

$$\frac{1}{2} (10'' \times 5'') = 25 \text{ square inches.}$$

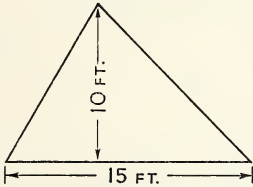
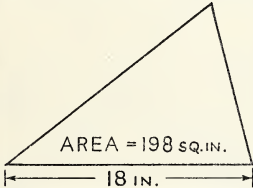
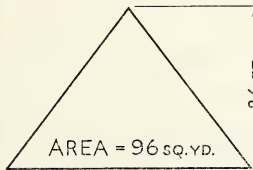
From the same formula, we derive the following:

$$(1) \text{ Height} = \text{Area} \div \frac{1}{2} \text{ Base.}$$

$$(2) \text{ Base} = \text{Area} \div \frac{1}{2} \text{ Height.}$$



1. Calculate the measurements of the following triangles as required.

<p>(1) Calculate the area.</p> 	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
<p>(2) Calculate the height.</p> 	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
<p>(3) Calculate the base.</p> 	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

2. The following tabulation represents dimensions of triangular figures. Fill in the blank spaces as required.

No.	BASE	HEIGHT	AREA	No.	BASE	HEIGHT	AREA
1	8 ft. 2 in.	10 ft. 0 in.	sq. ft.	6	rd.	12 rd.	84 sq. rd.
2	9 ft. 6 in.	ft. in.	38 sq. ft.	7	64 rd.	48 rd.	acres
3	ft. in.	9 ft. 0 in.	57 sq. ft.	8	yd.	10 yd.	100 sq. yd.
4	2 ft. 6 in.	1 ft. 4 in.	sq. ft.	9	2 yd.	ft.	6 sq. ft.
5	9 in.	in.	36 sq. in.	10	3 ft.	10 in.	sq. in.

CIRCLES

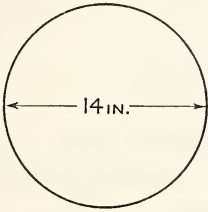
The *circumference* of a circle is its perimeter.

The *radius* of a circle is a line drawn from the center to the circumference.

The *diameter* of a circle is a line crossing the circle, passing through the center. The diameter, is therefore, twice the radius.

The circumference of a circle is approximately $3\frac{1}{7}$ times the diameter. This relationship is represented by the Greek symbol π , and is common to all circles. The numerical value of π is 3.14159, correct to five places of decimals; however, for the calculation of this unit, it is suggested that the approximate factor $3\frac{1}{7}$ be used.

EXAMPLE — Calculate the circumference of the illustrated circle.



Diameter = 14 in.

Circumference = $3\frac{1}{7} \times$ diameter.

= $3\frac{1}{7} \times 14$ in. = 44 in.

NOTE: Conversely, Diameter = Circumference $\div 3\frac{1}{7}$.

Therefore, Diameter = 44 in $\div 3\frac{1}{7}$.

= 14 in.

1. Calculate the measurements required.

<p>(1)</p>	<p>Calculate the diameter.</p> <hr style="border-top: 1px dotted black;"/> <hr style="border-top: 1px dotted black;"/> <hr style="border-top: 1px dotted black;"/> <hr style="border-top: 1px dotted black;"/>
<p>(2)</p>	<p>Calculate the circumference.</p> <hr style="border-top: 1px dotted black;"/> <hr style="border-top: 1px dotted black;"/> <hr style="border-top: 1px dotted black;"/> <hr style="border-top: 1px dotted black;"/>

2. Fill in the blanks.

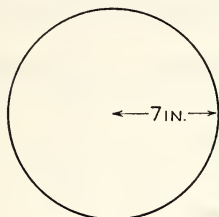
No.	RADIUS	DIAMETER	CIRCUMFERENCE	No.	RADIUS	DIAMETER	CIRCUMFERENCE
1	3 ft. 6 in.			6			$54\frac{1}{2}$ in.
2		21 ft. 0 in.		7	3 ft. 0 in.		
3			51 ft. 4 in.	8		5 in.	
4	5 yd.			9			$18\frac{3}{4}$ rd.
5		12 ft. 0 in.		10	2 ft. 4 in.		

CIRCLES

Area of a Circle

The formula for finding the area of a circle consists of the factor $3\frac{1}{7}$ multiplied by the radius squared ($3\frac{1}{7} \times \text{radius} \times \text{radius}$).

EXAMPLE — Calculate the area of the circle illustrated below.



$$\begin{aligned}\text{Area} &= 3\frac{1}{7} \times \text{radius}^2 \\ &= 3\frac{1}{7} \times \text{radius} \times \text{radius} \\ &= 3\frac{1}{7} \times 7 \text{ in.} \times 7 \text{ in.} \\ &= 154 \text{ sq. in.}\end{aligned}$$

1. Calculate the areas of the circles shown. Prepare solutions.

<p>(1)</p>	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
<p>(2)</p>	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

2. Fill in the blanks.

No.	RADIUS	DIAMETER	CIRCUM-FERENCE	AREA	No.	RADIUS	DIAMETER	CIRCUM-FERENCE	AREA
1	7 in.			sq. in.	7	$1\frac{3}{4}$ ft.			sq. ft.
2		28 in.		sq. ft.	8		7 in.		sq. in.
3			308 ft.	sq. yd.	9			154 in.	sq. ft.
4	3 ft.			sq. ft.	10	28 in.			sq. ft.
5		$3\frac{1}{2}$ ft.		sq. ft.	11		14 ft.		sq. yd.
6			44 in.	sq. in.	12			616 yd.	acres

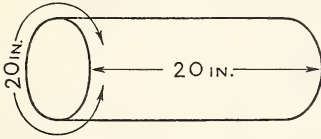
CYLINDRICAL AREAS

A *cylinder* is an object having a curved surface and circular ends of equal area. An ordinary tin can is a good example.

To illustrate the surface area of a cylinder, wrap a piece of paper which has been cut to the exact height of the cylinder around the cylinder, and cut the paper again so that its edges meet. When this paper is laid flat, it forms a rectangle, the length of which is the circumference of the cylinder, and the width of which is the length of the cylinder.

To calculate the area of a cylindrical surface, therefore, multiply the circumference of the cylinder by its length.

EXAMPLE — Calculate the area of the surface of the cylinder in the illustration.



$$\begin{aligned}\text{Cylindrical Area} &= \text{Circumference} \times \text{Length} \\ &= 20 \text{ in.} \times 20 \text{ in.} \\ &= 400 \text{ sq. in.}\end{aligned}$$

1. Calculate the areas of the curved surfaces of these cylinders.

<p>(1)</p>	<div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div>
<p>(2) Diameter = 8 in. Length = 20 ft.</p>	<div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div> <div style="border-bottom: 1px dotted black; height: 20px; margin-bottom: 5px;"></div>

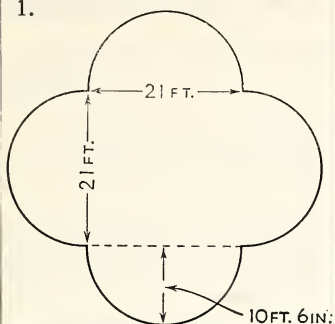
2. Calculate the curved surface area of each of the following cylinders.

No.	DIAMETER	LENGTH	CYLINDRICAL AREA	No.	DIAMETER	LENGTH	CYLINDRICAL AREA
1	1 ft. 9 in.	2 ft. 0 in.		6	5 in.	40 ft.	
2	10 in.	25 ft.		7	8 in.	10 ft.	
3	3 ft. 6 in.	5 ft. 6 in.		8	6 in.	24 ft.	
4	5 ft. 0 in.	10 ft. 0 in.		9	3 in.	30 ft.	
5	30 in.	3 ft. 6 in.		10	28 ft.	18 ft.	

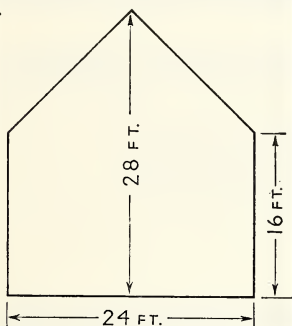
MISCELLANEOUS FIGURES

Calculate the areas of the figures on this page according to the dimensions given.

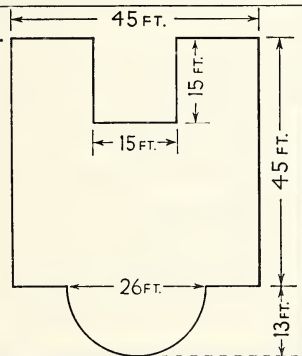
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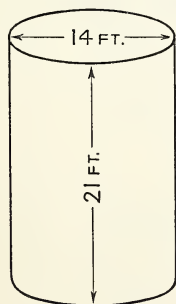
2.



3.



4.



Calculate the total area of the top, bottom, and curved surfaces.

MISCELLANEOUS PROBLEMS ON AREAS

Prepare solutions for the following problems.

1. How many square yards of asbestos wrapping are required to cover 55 feet of hot-air furnace pipes, 11 inches in diameter?

2. The diameter of a bicycle wheel is 28 inches. How many times does it revolve in travelling a distance of one mile?

3. The gable end of a building is 35 feet wide, and the height of the gable section is 10 feet. What is the area of the gable?

4. A rectangular farm is 726 yards long and 400 yards wide. The land is all seeded except for a strip, averaging 6 feet wide, all around the farm. How many acres does this strip represent? (Calculate to three decimal places.)

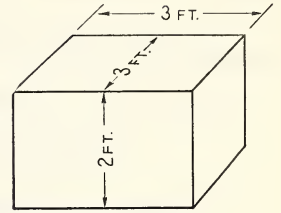
VOLUME OF RECTANGULAR SOLIDS

The volumes of all rectangular solids are expressed in terms of cubes; for example, cubic inches, cubic feet, etc.

The *volume* of a rectangular solid is the Length \times Width \times Depth (or Height).

The volume of the figure to the right is, therefore, 3 ft., 0 in. \times 3 ft., 0 in. \times 2 ft., 0 in., or 18 cubic feet.

Note that *feet* multiplied by *feet* gives *square feet*; and *square feet* multiplied by *feet* gives *cubic feet*. Conversely, *cubic feet* divided by *feet* gives *square feet*, and *square feet* divided by *feet* gives *feet*.



Therefore, if the volume and any two of the linear dimensions of a rectangular solid are given, the other dimension may be found.

EXAMPLE—Knowing that the volume of the figure in the illustration is 18 cubic feet, the width 3 feet and the height 2 feet, calculate the length.

$$\text{Length} \times \text{Width} \times \text{Height} = \text{Volume.}$$

$$\text{Length} \times 3 \text{ ft.} \times 2 \text{ ft.} = 18 \text{ cubic ft.}$$

$$\text{Therefore, length} = 18 \text{ cu. ft.} \div (3 \text{ ft.} \times 2 \text{ ft.})$$

$$= 18 \text{ cu. ft.} \div 6 \text{ sq. ft.}$$

$$= 3 \text{ ft.}$$

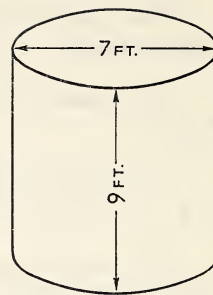
The following table gives certain dimensions of rectangular solids; in each case find the missing dimension.

No.	LENGTH	WIDTH	HEIGHT	VOLUME
1	2 ft., 6 in.	3 ft., 6 in.	4 ft., 6 in.	cu. in.
2	6 ft., 0 in.	5 ft., 0 in.		120 cu. ft.
3	4 ft., 8 in.		2 ft., 4 in.	49 cu. ft.
4		10 ft., 6 in.	6 ft., 6 in.	30 cu. yd., 9 cu. ft.
5	40 ft., 0 in.	24 ft., 0 in.	7 ft., 6 in.	cu. yd.
6	100 ft., 0 in.	4 ft., 0 in.		50 cu. yd.
7	28 ft., 0 in.		13 ft., 0 in.	296 cu. yd., 16 cu. ft.
8		2 ft., 6 in.	1 ft., 6 in.	30 cu. ft.
9	40 ft., 0 in.	9 ft., 0 in.	3 ft., 9 in.	
10	9 in.	4½ in.		121½ cu. in.

VOLUME OF CYLINDRICAL SOLIDS

Following the principle already explained in the case of rectangular solids, the volume of a cylindrical solid is the area of the circular end multiplied by the length of the cylinder.

Thus, the volume of the figure to the right is the area of the circular end multiplied by the length. Using the dimensions given:



$$\begin{aligned}\text{Volume} &= 3\frac{1}{2} \times \text{Radius} \times \text{Radius} \times \text{Length} \\ &= 3\frac{1}{2} \times 3\frac{1}{2} \text{ ft.} \times 3\frac{1}{2} \text{ ft.} \times 9 \text{ ft.} \\ &= 346\frac{1}{2} \text{ cu. ft.}\end{aligned}$$

1. Prepare neat solutions for the following problems.

(1) A tank is 7 ft. in diameter and 20 ft. long. Assuming that $6\frac{1}{4}$ gallons occupy approximately one cubic foot of space, how many gallons will the tank contain?

(2) A cylindrical tank is 7 feet in diameter. How deep would it have to be to contain 1000 gallons of water. (1 cu. ft. = approximately $6\frac{1}{4}$ gal.)

2. The following are certain measurements of cylindrical solids. Fill in the missing measurements.

No.	RADIUS	DIAMETER	CIRCUMFERENCE	LENGTH	VOLUME
1	1 ft., 9 in.			8 ft., 6 in.	
2		5 ft., 0 in.		6 ft., 0 in.	
3			308 ft.	4 ft., 6 in.	
4	10 ft., 0 in.			10 ft., 0 in.	
5		28 ft., 0 in.		14 ft., 0 in.	

PROBLEMS ON VOLUME

Prepare solutions for the following problems.

1. Find the cost of concrete for a garage floor, 20 ft. long, 12 ft. wide, and 4 inches thick. The concrete costs \$12.50 a cubic yard.

2. Assuming that a ton of coal occupies approximately 35 cubic feet of space, how many tons of coal will be contained in a coal bin, 8 feet long, 5 feet wide, and 7 feet, 6 inches high?

3. How many lineal feet of wire, $\frac{1}{16}$ of an inch in diameter, can be drawn from a cubic foot of copper?

4. How many cubic yards of cement would be required for a cement walk, 7 feet wide and 4 inches thick, around a circular pool which has a diameter of 42 feet?

PROBLEMS ON VOLUME

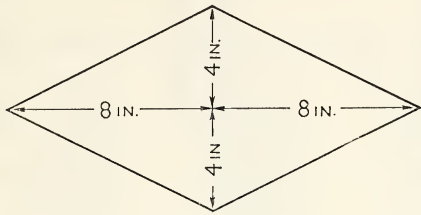
5. How many cubic yards of concrete would be required for the walls of a basement, 12 inches thick, and 7 feet high, if the outside measurements of the basement are 30 feet by 28 feet?

6. What would be the inside dimensions of a box required to contain 4 dozen cans in two layers, each can being 3 inches in diameter and $4\frac{1}{2}$ inches high? Each layer is arranged in six rows of four cans.

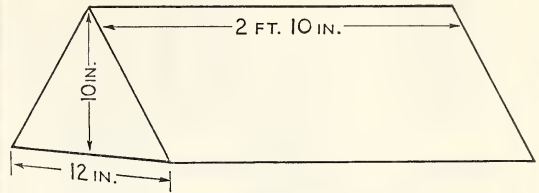
7. How many cans, 3 inches in diameter and $4\frac{1}{2}$ inches high, can be filled from the contents of a can containing 5 gallons? (One cubic foot equals $6\frac{1}{4}$ gallons.)

8. How many gallons will be contained in a rectangular tank, 3 feet long, 2 feet wide, and 18 inches deep? (One cubic foot contains $6\frac{1}{4}$ gallons.)

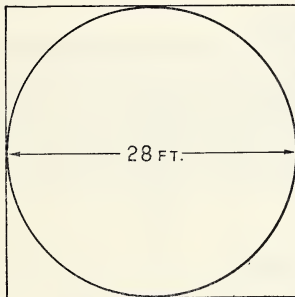
1. Find the area of the figure below.



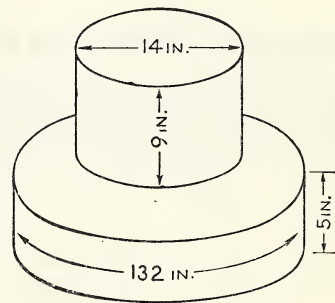
2. Find the volume of the figure below.



3. Find the area of the square not covered by the circle.



4. Find the total volume of the figure below.



GENERAL PRACTICE IN FUNDAMENTAL OPERATIONS

1. Add the following.

(a) \$ 62.25 146.34 342.50 90.95 114.23 323.32 78.45	(b) \$172.28 134.18 345.67 23.57 187.50 114.14 14.45	(c) \$161.54 98.74 39.09 176.45 118.81 89.87 187.32	(d) \$176.92 13.24 456.54 231.15 451.32 98.35 107.75	(e) \$325.54 132.19 324.55 309.65 341.05 43.50 431.19
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2. Multiply the following.

(a) 463817 6	(b) 236197 7	(c) 463982 8	(d) 634567 9	(e) 134576 11
-----------------	-----------------	-----------------	-----------------	------------------

3. Calculate the following.

(a) 461 lbs. @ \$.11 209 " " .09 45 " " .08 611 " " .07 36 " " .12	(b) 117 lbs. @ \$.07 132 " " .15 617 " " .10 43 " " .12 62 " " .11	(c) 24 lbs. @ \$1.01 14 " " .99 23 " " .10 47 " " 1.00 23 " " 1.00
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4. Find the areas of triangles of the following dimensions.

BASE	HEIGHT	AREA
1. 14 in.	8 in.	
2. 4 ft.	30 in.	
3. 12 in.	15 in.	
4. 10 in.	19 in.	
5. 6½ in.	10 in.	

5. Find the areas of rectangles of the following dimensions.

LENGTH	WIDTH	AREA
1. 11 in.	7 in.	
2. 20 in.	13 in.	
3. 9 ft., 6 in.	7 ft.	
4. 14 ft.	10 ft., 6 in.	
5. 12 yd.	7 yd.	

6. Find the areas of circles with dimensions as follows:

DIMENSION	AREA
1. Diameter = 6 in.	
2. Radius = 7 in.	
3. Diameter = 4.2 in.	
4. Radius = 3½ in.	
5. Diameter = 10 in.	

7. Find the circumferences of circles with dimensions as follows:

DIMENSION	AREA
1. Radius = 3.5 in.	
2. Diameter = 14 in.	
3. Radius = 2.8 in.	
4. Diameter = 8.4 in.	
5. Radius = 1 in.	

REVIEW ASSIGNMENTS

UNITS 1 to 10

UNIT 1 — FUNDAMENTAL OPERATIONS WITH WHOLE NUMBERS

1. Complete the following, showing vertical, horizontal and proving totals.

(1) 6,842.18	(2) 7,163.49	(3) 9,176.34	(4) 7,186.36	(5) 7,345.45
976.33	2,749.51	6,273.48	9,273.44	2,344.43
8,134.67	3,234.55	7,450.35	8,323.51	1,345.34
7,347.75	3,478.47	4,389.99	3,388.37	7,678.45
8,909.49	4,789.67	6,789.38	7,787.78	3,474.47
8,378.87	4,832.22	4,438.18	1,181.11	3,801.19
2,213.31	4,322.78	7,717.15	4,877.44	3,781.21
4,343.11	1,456.34	3,342.25	3,345.55	7,341.33

Total

2. Multiply — Use short methods where possible.

(1) $6875 \times 7 =$	(2) $424 \times 25 =$	(3) $67 \times 101 =$
$2879 \times 8 =$	$324 \times 50 =$	$83 \times 99 =$
$6428 \times 9 =$	$312 \times 11 =$	$34 \times 102 =$
$6897 \times 12 =$	$245 \times 50 =$	$32 \times 98 =$
$9876 \times 5 =$	$1001 \times 38 =$	$64 \times 75 =$
$8467 \times 6 =$	$303 \times 101 =$	$84 \times 25 =$

3. The school dance committee bought 24 cases of soft drinks at \$1.20 a case. At the end of the dance, 3 full cases and 20 bottles remained unsold. If a case contained 24 bottles, and a bottle sold for 10¢, what was the profit? (Unsold bottles are returned.)

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4. If, in problem 3, the students in charge of sales were given \$7.00 in change before the dance, and each of the 15 students on the committee had drunk one bottle, how much money should be in the cash box before paying for the 24 cases?

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5. A student, who rode the bus to school and back, and who ate in the school cafeteria, bought 3 bus tickets for 25¢, and paid 25¢ a day for lunch. If the student attended school 75 days in the fall term, what was the total cost for bus fare and lunch?

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6. At a school dance, the photography club took 123 pictures, to be sold for 50¢ each. If film cost 6¢ a picture, and paper and chemicals cost a total of \$14.35, what profit did the club make?

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UNIT 2 — FUNDAMENTAL OPERATIONS WITH FRACTIONS

1. Find the H.C.F. of 780 and 1530	2. Find the H.C.F. of 624 and 816	3. Find the L.C.M. of 56, 32, 28, 16
4. Simplify. $\frac{2}{3}$ of $4\frac{1}{2} + 1\frac{1}{8} \div \frac{3}{8} - 1\frac{1}{3}$	5. Simplify. $\frac{4}{5}$ of $(\frac{5}{6} + 1\frac{1}{4}) \div \frac{5}{8} - \frac{3}{8}$	6. Simplify. $\frac{2\frac{2}{5} + \frac{3}{10}}{\frac{1}{7} \text{ of } 5\frac{1}{4}} - \frac{\frac{1}{2} \text{ of } 3\frac{1}{2}}{5\frac{1}{8} - 3\frac{1}{4}}$
7. A merchant bought $83\frac{3}{4}$ yd. of material for $\$2.87\frac{1}{2}$ a yd. He sold $43\frac{3}{4}$ yd. for $\$3.87\frac{1}{2}$ a yd. He sold $\frac{5}{8}$ of the remainder for $\$3.55$ a yd., and the balance for $\$2.75\frac{1}{2}$ a yd. What did he gain?		8. A high school girl served as a baby-sitter for a neighbour for 25¢ an hour until midnight, and 35¢ an hour after midnight. If she arrived at 8:30 p.m. and left at 1:30 a.m., what amount did she earn?
9. A closed box is made of $\frac{5}{8}$ -inch plywood. If it measures $8\frac{1}{2}$ in. long, $5\frac{3}{4}$ in. wide, and 4 in. high on the outside, what are the inside dimensions?		10. A workman worked for 5 days as follows: $8\frac{1}{2}$, $9\frac{3}{4}$, $7\frac{1}{4}$, $8\frac{3}{4}$, and 9 hours. If he was paid $\$1.87\frac{1}{2}$ an hour, what was his pay for the week?

UNIT 3 — FUNDAMENTAL OPERATIONS WITH DECIMALS

1. Add, subtract, multiply, or divide as indicated.

(1) $2.90 + .290$	(2) $290 - .290$	(3) $125 \times .5$	(4) $1.25 \div 5$
(5) $.290 + .029$	(6) $2.90 - .290$	(7) $12.05 \times .05$	(8) $.125 \div .05$

2. Express in fractions in their lowest terms.

3. Express as decimals.

(1) .225	(2) 3.025	(1) $7/20$	(2) $10 \frac{3}{40}$
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4. Express as decimal fractions.

5. Express as common fractions.

(1) $\frac{5\frac{3}{4} + 1\frac{1}{2}}{\frac{1}{2}}$	(2) $\frac{4\frac{1}{8} - 2\frac{3}{4}}{.25}$	(1) $\frac{1.75 + 2.5}{1.4}$	(2) $\frac{2.4 \times 1.5}{5 \times .3}$
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6. What would be the cost of 10.8 gallons of gasoline at $42\frac{1}{2}\text{¢}$ per gallon?

7. At 40.5 cents a gallon, how many gallons of gasoline can be purchased for \$4.86?

8. A sample of ore consists of .003 lead, .009 copper, and .012 silver, and the balance is waste rock. How many pounds of each is there in a half ton of ore?

9. It will require $37\frac{3}{4}$ yards of carpet to carpet a living room. What will it cost if carpet is purchased for $\$8.75\frac{1}{2}$ a yard, and the cost of laying is $\$1.22\frac{1}{2}$ a yard?

UNIT 4 — PROBLEMS IN PROPORTION

1. If 3 yards of material cost \$2.25, how many yards can be purchased for \$15.75?

2. If a car travels 5280 feet in one minute, how far will it go in 2.5 seconds?

3. A man owned a half-share in a business. He sold $\frac{1}{3}$ of his share for \$5,000. At this rate what was the whole business worth?

4. An article sold for \$280, thereby making a profit of one-quarter of the cost. What was the cost?

5. If $\frac{5}{24}$ of an estate is worth \$2,000, what is the value of the whole estate?

6. Divide \$45 between two persons so that one person receives $1\frac{1}{2}$ times as much as the other.

7. A used car was sold for \$1,500. If this represents $\frac{3}{4}$ of the original price, what was the original price?

8. Divide \$1,800 between John, Bill, and Mary in the proportion of 3, 4, and 5, respectively.

UNIT 5 — FUNDAMENTAL OPERATIONS WITH PERCENTAGE

1. In the blank spaces write the required equivalents.

NO.	FRAC.	DEC.	%	NO.	FRAC.	DEC.	%	NO.	FRAC.	DEC.	%	NO.	FRAC.	DEC.	%
1	$\frac{1}{5}$			2		.375		3			25	4	$\frac{3}{8}$		
5		.045		6			90	7	$3\frac{3}{4}$			8		1.125	
9			135	10	$\frac{5}{8}$			11		.005		12			$3\frac{1}{2}$
13	$\frac{1}{12}$			14		.035		15			$33\frac{1}{3}$	16	$\frac{1}{6}$		
17		1.1		18			$\frac{1}{4}$	19	$\frac{3}{10}$			20		.875	

2. Calculate.

(1) $12\frac{1}{2}\%$ of \$1,680	(2) $\frac{1}{2}\%$ of \$2,200	(3) 137% of \$135
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3. What percent is the first quantity of the second?

(1) 8 hours of 1 day.	(2) 3 planes of 45 planes.	(3) 4 hits out of 15 shots.
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4. Solve.

(1) \$1,500 is $37\frac{1}{2}\%$ of what amount?	(2) \$12.40 is 4% of what amount?	(3) \$481.20 is $100\frac{1}{4}\%$ of what amount?
<p>5. The total possible score on a test was 180 marks. (a) If a student received 126 marks, what per cent was made on the test? (b) If a student received 55%, what was his score?</p>		<p>6. A worker earning \$1.44 an hour received a $12\frac{1}{2}\%$ raise. How much would the increase amount to in a year of 290 working days of 8 hours each?</p>
<p>7. A firm's gross profit was \$6,000. Expenses were: Salaries, \$2,000; Taxes, \$300; Advertising, \$1,000; Rent, \$1,800. Find what per cent each expense and the net profit was of the gross profit.</p>		<p>8. A student typed 2,100 strokes in a 5-minute test, and made 6 errors. If 5 strokes count as one word, what per cent is the number of errors of the number of words typed.</p>

UNIT 6 — CASH AND TRADE DISCOUNTS

1. Following is an invoice in condensed form. Show the required extensions and amount of payment on the date indicated.

Date: Dec. 1
Terms: 2/10, n/30

24 articles @ \$14.50
18 articles @ \$8.75
Less 15% & 10%
Net amount
Amount required for payment on Dec. 10

2. A retail merchant purchased some merchandise at a list price of \$360 less discounts of $16\frac{2}{3}\%$ and $12\frac{1}{3}\%$. He sold the goods at the same list price less discounts of 20% and 5%. Find his profit or loss.

3. Which of the following series of discounts is the greater, and by how much? (a) 20%, 5%, and 5%, (b) 10%, 10% and 10%. Show your solution.

(a)

(b)

4. On a bill of goods amounting to \$360, which would be the better offer and by how much? (a) Trade discounts of 25% and 20% or (b) 30% and 15%. Show solution.

(a)

(b)

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5. Using a scratch pad for your calculations, fill in the Amount of Payment according to the information given in the other columns.

No.	DATE OF INVOICE	LIST PRICE	TRADE DISCOUNTS	TERMS	DATE OF PAYMENT	AMT. OF PAYMENT	
1	Mar. 28	\$108.00	20% and 10%	2/10, n/30	Apr. 7		
2	June 6	215.50	10% and 10%	5/10, n/30	June 11		
3	Oct. 30	180.80	$12\frac{1}{2}\%$ and 10%	4/10, n/60	Nov. 6		
4	Dec. 29	468.00	25% and 20%	5/10, 2/30, n/60	Jan. 3		
5	Sept. 18	416.40	25% and 10%	3/10, 1/30, n/60	Oct. 13		
6	Feb. 21	324.00	$16\frac{2}{3}\%$ and 5%	2/10, 1/30, n/60	Mar. 15		

UNIT 6 — PROFIT AND LOSS AND COMMISSION

1. From the data given in each case, determine the figures for the remaining columns.

No.	COST PRICE	PER CENT PROFIT ON COST	PROFIT	SELLING PRICE	PER CENT PROFIT ON SALES
1	\$250.00	20%	\$	\$	
2		25%	\$85.00		
3			\$48.00	\$144.00	
4				\$195.00	40%

2. Complete the following statement as indicated. Note that per cents are based on sales.

Profit and Loss Statement for the Year Ending December 31, 19—

Sales	\$25,000	100%
Cost of Sales	_____	_____
Gross Profit		20%
Operating costs	_____	_____
Net Profit	\$ 2,500	_____

3. A radio bought at a list price of \$224, less discounts of 30% and 12½%, is sold for \$157.78, C.O.D., or for \$185.22 on a time payment plan.

(a) Find the retailer's net cost.

(b) Find the retailer's per cent of profit on cost if he sells on the time payment plan.

(c) Find the retailer's per cent profit if he sells C.O.D.

(d) What per cent of the C.O.D. price is the difference between the C.O.D. price and the time payment plan price?

4. Complete the following Account Sales.

Total sales	(a)	\$1,719.00
Charges		
Cartage	\$17.90	
Miscellaneous	15.48	
4½% Commission	_____	_____
Net proceeds	_____	_____

Total sales	(b)	\$1,852.00
Charges		
Freight	\$57.52	
Other charges	31.64	
8% Commission	_____	_____
Net proceeds	_____	_____

UNIT 6 — SIMPLE INTEREST AND BANKING

1. Find the simple interest for each of the following. Show the application of the formula, $\text{Principal} \times \text{Rate} \times \text{Time} = \text{Interest}$.

NO.	PRINCIPAL	RATE	TIME	APPLICATION OF FORMULA	INTEREST	
1	\$1,450.00	6 %	2 years, 3 months			
2	380.00	5½%	30 days			
3	1,150.00	4½%	Apr. 10 to Nov. 15			

2. On March 1, a bank loaned a customer \$500, accepting his note payable on demand and bearing interest at 6%. On April 1, the customer paid the interest accrued and \$250 on the note. On May 1, he paid the interest due and the balance of the note. What was the total amount of interest paid?

3. On March 1, a man borrowed \$500 from his bank, giving the bank his promissory note payable two months from that date. The bank discounted the note immediately at 6%, the proceeds being deposited to the man's account. What were the proceeds?

4. The following out-of-town cheques were included in one deposit, the exchange rate being $\frac{1}{8}\%$; minimum charge, 15 cents. Using the columns below, show the exchange on each cheque and the total for each column.

5. From the following facts, make a bank reconciliation statement in proper form.

Balance according to cheque book stub, \$146.70; balance according to bank statement, \$214.25; outstanding cheque, \$68.30; bank service charges for the month according to bank statement, 75 cents.

FACE OF CHEQUE	EXCHANGE	NET DEPOSIT
\$ 25.80
142.60
75.00
218.00
19.27
1,010.00
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UNITS 7 AND 8 — INSURANCE AND MUNICIPAL TAXES

1. If the annual rate on a \$2,500 life insurance policy is \$33.60 per \$1,000, how much will have been paid in premiums over a period of 25 years?

2. A man insured his home for \$15,000 at 85 cents per \$100 for a three-year policy. How much did he pay in premiums over a period of 18 years?

3. An automobile insurance policy cost \$135 for one year. If the auto is driven 10,000 miles in that year, what is the cost per mile for insurance?

4. A and B built identical homes, but in different cities. A's home was assessed at \$3,800 under a tax rate of 60 mills, while B's home was assessed at \$6,000 under a tax rate of 38 mills. Compare the taxes paid by A and B.

5. A city has a total assessment of \$125,000,000. The tax rate for school purposes is 24 mills. If there are 8,000 children attending school in that city, what is the average tax cost per pupil?

6. A house is insured for \$12,000 at a rate of 90 cents per \$100 for a three-year policy. The same house is assessed for \$4,250 at a tax rate of 58 mills. What is the average monthly cost of insurance and taxes together?

7. A house is assessed for \$3,500 at a tax rate of 60 mills. At this time the city council revised its assessments by raising all assessments 20%, and at the same time, reducing the tax rate 20%. What would be the change in taxes on this house?

UNIT 9 — WEIGHTS AND MEASURES

1. Add.

4 yd., 1 ft., 10 in.
18 yd., 2 ft., 11 in.

2. Subtract.

18 gal., 2 qt., 0 pt.
13 gal., 3 qt., 1 pt.

3. Multiply.

5 bu., 1 pk., 1 gal.
x 9

4. Divide.

12) 76 lb., 8 oz.

5. How many pieces, each 3 ft., 6 in. long, can be cut from a length of 35 feet?

6. Express 360 lb. as a decimal fraction of a ton.

7. Find the cost of 2 ft., 6 in. of material at \$7.20 a yard.

8. How many 12-ounce packages can be made up out of a bulk lot of 1800 lb?

9. Express 35 ft., 6 in. in yards to three decimal places.

10. Express a gallon (American) as a decimal fraction of a gallon (Canadian).

11. How many Canadian gallons would be equivalent to 16 American gallons? (Answer to three decimal places.)

12. How many American gallons would be equivalent to 14 Canadian gallons? (Answer to three decimal places.)

13. How many board feet are there in a timber 10 inches square at each end and 24 feet long?

14. What would be the cost of 150 pieces of two-by-four, 16 feet long, at \$120 for a thousand board feet?

UNIT 10 — PRACTICAL MEASUREMENTS

1. The following table gives certain measurements of rectangular solids. In each case find the missing dimension.

No.	LENGTH	WIDTH	HEIGHT	VOLUME
1	4 ft., 3 in.	2 ft., 6 in.	1 ft., 3 in.	
2	8 ft., 0 in.	3 ft., 0 in.		48 cu. ft.
3	16 ft., 0 in.		2 ft., 0 in.	80 cu. ft.
4		18 ft., 0 in.	4 inches	12 cu. yd.

2. The following table gives certain measurements of cylindrical solids. Fill in the missing measurements.

No.	RADIUS	DIAMETER	CIRCUMFERENCE	LENGTH	VOLUME (CU. FT.)
1	1 ft., 2 in.			4 ft., 6 in.	
2		3 ft., 6 in.		7 ft., 0 in.	
3			176 ft., 0 in.	1 ft., 6 in.	

3. A room is 24 feet long and 14 feet wide. How many floor tiles, each 9 inches square, would be required to cover it? Pieces cut from tiles are considered wasted.

4. A cylindrical tank is 7 feet in diameter and 15 feet long. Find the total surface area, including both ends.

5. Assuming that one cubic foot is equivalent to $6\frac{1}{4}$ gallons in volume, how many gallons would the tank in problem 4 contain?

6. How many cubic yards of cement are required to make a concrete driveway 80 feet long, 9 feet wide and 6 inches thick?

ROUGH CALCULATIONS

ROUGH CALCULATIONS

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ROUGH CALCULATIONS

ROUGH CALCULATIONS

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ROUGH CALCULATIONS

QA 135 P51 BK-2
PEW GEORGE F
ARITHMETIC FOR EVERYDAY USE

40868437 CURR HIST



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WEIGHTS AND MEASURES

THE ENGLISH SYSTEM

Length

12 inches (in.)	= 1 foot (ft.)
3 feet	= 1 yard (yd.)
5½ yards	= 1 rod (rd.)
320 rods	= 1 mile (mi.)
1 mile	= 1760 yards
1 furlong	= 220 yards
1 fathom (used to measure depth at sea)	= 6 feet
1 knot	= 6080 feet

Area

144 square inches (sq. in.)	= 1 sq. foot
9 square feet	= 1 sq. yard
30¼ square yards	= 1 sq. rod
160 square rods	= 1 acre
640 acres	= 1 sq. mile
4840 square yards	= 1 acre

Volume

1728 cubic inches (cu. in.)	= 1 cu. foot
27 cubic feet	= 1 cu. yard
1 cord (used in measuring wood)	= 128 cu. feet
A cord of wood is 8 feet long, 4 feet wide and 4 feet high.	

Avoirdupois

16 ounces (oz.)
100 pounds
2000 pounds
1 pound
1 ounce
1 long ton

Troy

(used for weighing gold and silver)
24 grains
20 pennyweights (dwt.)
12 ounces
1 lb. Troy
1 oz. Troy
The weight of diamonds is measured in carats (k). 1 carat is about 1/5 of a gram.
The fineness of gold is measured in karats (k). Thus, 18k gold is 18/24 pure gold and the remaining 6/24 is alloy.

Liquid Measure

4 gills	= 1 pint (pt.)
2 pints	= 1 quart (qt.)
4 quarts	= 1 gallon (gal.)
6¼ gal. (Can.) in volume	= 1 cu. foot (approx.)
1 gal. (Can.) in volume	= 277.274 cu. inches
1 gal. (U.S.) in volume	= 231 cu. inches
1 gallon water weighs 10 pounds.	

Dry Measure

2 pints	= 1 quart
4 quarts	= 1 gallon
2 gallons	= 1 peck (pk.)
4 pecks	= 1 bushel (bu.)

Bushels by weight are as follows:

Barley	= 48 lb.	Oats	= 34 lb.
Beans	= 60 lb.	Onions	= 50 lb.
Beets	= 50 lb.	Parsnips	= 45 lb.
Buckwheat	= 48 lb.	Peas	= 60 lb.
Carrots	= 50 lb.	Potatoes	= 60 lb.
Corn	= 56 lb.	Wheat	= 60 lb.

Number

= 1 dozen (doz.)
= 1 gross (gro.)

Paper

= 1 quire
= 1 ream

Angles

= 1 minute
= 1 degree
= 1 circle
= 90 degrees

Lumber

The measure of lumber is the board foot. The board foot is a piece of lumber 1 foot long, 1 foot wide and 1 inch thick. The result by the thickness.

12 inches wide, 12 feet long measures 12 board feet.

